

**Appendix 2.1**

**Information to Inform a Habitats Regulations Appraisal**



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### **Dounreay Tri Floating Wind Demonstration Project**

Dounreay Tri Limited  
16 September 2016

Prepared	Philip Bloor
Checked	Jack Farnham, Kate Hopkinson
Approved	Marcus Thor
Doc. Ref.	03363-001135
Ver. no.	3

## Document history

Version	Date	Person	Comment
1	29/03/2016	Philip Bloor	1 <sup>st</sup> Draft
2	06/09/2016	Philip Bloor	2 <sup>nd</sup> Draft
3	16/09/2016	Philip Bloor	3 <sup>rd</sup> Draft

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## Acronyms and Abbreviations

AA	Appropriate Assessment
BDMP	Biologically Defined Minimum Population
BDMPS	Biologically Defined Minimum Population Scales
CRM	Collision risk modelling
dSAC	Draft Special Area of Conservation
dSPA	Draft Special Protection Area
EC	European Commission
EMF	Electromagnetic Fields
EPS	European Protected Species
HDD	Horizontal Directional Drilling
HIE	Highland and Islands Enterprise
HRA	Habitats Regulations Appraisal
IROPI	Imperative Reasons of Overriding Public Interest
km	Kilometres
LAT	Lowest Astronomical Tide
Ltd	Limited
m	metre
MLWS	Mean Low Water Springs
MS-LOT	Marine Scotland Licensing Operations Team
MW	Mega Watt
pSAC	Possible Special Area of Conservation
pSPA	Potential Special Protection Area
RSPB	Royal Society for the Protection of Bird
SAC	Special Area of Conservation
SCI	Site of Community Importance
s.d.	Standard Deviation

SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
STW	Scottish Territorial Waters

## 1 Introduction

- 1.1 This Appendix presents a Habitats Regulations Appraisal (HRA) on potential impacts on sites of nature conservation importance as a result of the development, operation and future decommissioning of the proposed Dounreay Tri offshore wind farm.
- 1.2 Before authorising a plan or project the competent authority is required under the Habitats Regulations to assess whether the plan or project will have a likely significant effect on a European designated site. This HRA provides the relevant supporting information to help inform the competent authority when undertaking the assessment and should be read in conjunction with the relevant Environmental Chapters and associated Annexes, namely:
  - Chapter 4: *Project Description*,
  - Chapter 6: *Physical and Coastal Processes*,
  - Chapter 9: *Fish Ecology*,
  - Chapter 10: *Marine Mammals* (and associated technical appendix),
  - Chapter 11: *Ornithology* (and associated technical appendix),
  - Chapter 23: *Terrestrial Ornithology*,
  - Chapter 24: *Terrestrial Ecology*.
- 1.3 The appraisal addresses impacts from activities up to the Mean Low Water Springs (MLWS) and the onshore elements of the proposed project.
- 1.4 This appraisal takes into consideration comments received during consultation from stakeholders including Marine Scotland Licensing Operations Team (MS-LOT), Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB).

## 2 Consultation

- 2.1 As part of the consultation process, stakeholders were invited to respond to a Scoping Report produced as part of the application process in January 2016. Subsequent meetings were held with Marine Scotland on 29 January 2016 and the RSPB on 7 March 2016.
- 2.2 A summary of the key points raised during consultation regarding Habitats Regulations Appraisal is presented in Table 2-1.

**Table 2-1: Summary of consultation responses with regard to Habitats Regulations Appraisal.**

Consultee	Form of Response	Date	Issues Raised
RSPB	Meeting	7 March 2016	<p>The potential effects from displacement of Auks should be assessed based on 1 km displacement radius and considering a range of displacement (0-100%) The assessment of displacement should include consideration of the CEH model on displacement and present the % loss of foraging area within the mean-max foraging range.</p> <p>Advised consideration should be given to the Pentland Firth and Scapa Flow dSPA and West Coast dSAC as these could become pSPA/pSAC during the consenting process.</p>
SNH	Scoping	4 March 2016	<p>SNH advise that the impact assessment uses the 'worst case' of the maximum densities of birds recorded in the survey.</p> <p>Decisions as to which SPAs and SACs are to be included in the EIA and HRA process should follow an iterative process.</p> <p>Connectivity (for breeding seabirds) should be established based on the maximum foraging ranges (+1 s.d.) as reported in Thaxter <i>et al.</i> (2012).</p> <p>The potential activities that will have impact on marine birds during each of the construction, operation and decommissioning phases are listed in the report. It does not appear that any likely impacts will be overlooked if the assessment covers these areas.</p> <p>The project is outwith the Pentland Firth and Scapa Flow draft SPA and North Orkney draft SPA. It is considered unlikely that the project will have any significant effects on the qualifying interests of the draft SPAs. However, this will need to be assessed in the HRA.</p>
RSPB	Scoping	16 February 2016	<p>We agree with the scoping report in that a significant effect on Special Protection Areas (SPAs) cannot be ruled out.</p> <p>RSPB Scotland recommends that the implications of this development on draft SPAs be fully considered in the HRA.</p>
Marine Scotland Licensing	Meeting	29 January 2016	<p>Advised to ensure robust and thorough HRA process.</p> <p>Broadly in agreement with proposed approach and sites to be considered in HRA.</p>

### 3 Legislative Context and Regulatory Requirements

- 3.1 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive) aim to ensure the long-term survival of certain species and habitats by protecting them from adverse effects of plans and projects.
- 3.2 The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation (SACs). The Birds Directive provides for the classification of sites for the protection of rare and vulnerable birds and for regularly occurring migratory species. These sites are called Special Protection Areas (SPAs). SACs and SPAs are collectively termed European sites and form part of a network of protected sites across Europe. This network is called Natura 2000. A Site of Community Importance (SCI) is a site in the process of receiving approval; it has received approval from the European Commission (EC) but has still to be formally designated as a SAC by the UK Government.
- 3.3 Possible SACs (pSACs) and potential SPAs (pSPAs) are afforded the same levels of protection by UK Government as if they were designated. Sites designated under the Ramsar Convention are also afforded the same protection as a designated site.
- 3.4 Species of nature conservation interest not benefitting from protection within the Natura 2000 network but listed within Annex IV of the Habitats Directive receive a different level of protection; these are known as European Protected Species (EPS).
- 3.5 Within Scottish territorial waters (STW) the transposing legislation for the Habitats and Birds Directives are the Wildlife and Countryside Act 1981 (as amended), the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations) and the Nature Conservation (Scotland) Act 2004.
- 3.6 The Regulations require the competent authority to carry out a Habitats Regulations Appraisal if a project is likely to have a significant effect on a Natura 2000 site. Any plan or project which either alone or in-combination with other plans or projects would be likely to have a significant effect on a qualifying site must be subject to an appropriate assessment (AA) to determine the implications for a site's conservation objectives. Such a plan or project may only be agreed after ascertaining that it will not adversely affect the integrity of a SAC/pSAC or SPA/pSPA unless there are imperative reasons of overriding public interest for carrying out the plan or project. Draft sites, i.e. those that have not been subject to any formal consultation, are not subject to the Appropriate Assessment process.
- 3.7 Under Regulation 48 (2) of the Habitats Regulations '*A person applying for any such consent, permission or other authorisation shall provide such information as the competent authority may reasonably require for the purposes of the assessment*'. The purpose of this document is to provide the necessary information to allow the competent authority to undertake an assessment.
- 3.8 The potential significant impacts of the proposed Dounreay Tri development upon sites' qualifying features and nature conservation objectives have been assessed and summarised in this document to inform the assessment by the competent authority.

## 4 Approach to Habitats Regulations Appraisal

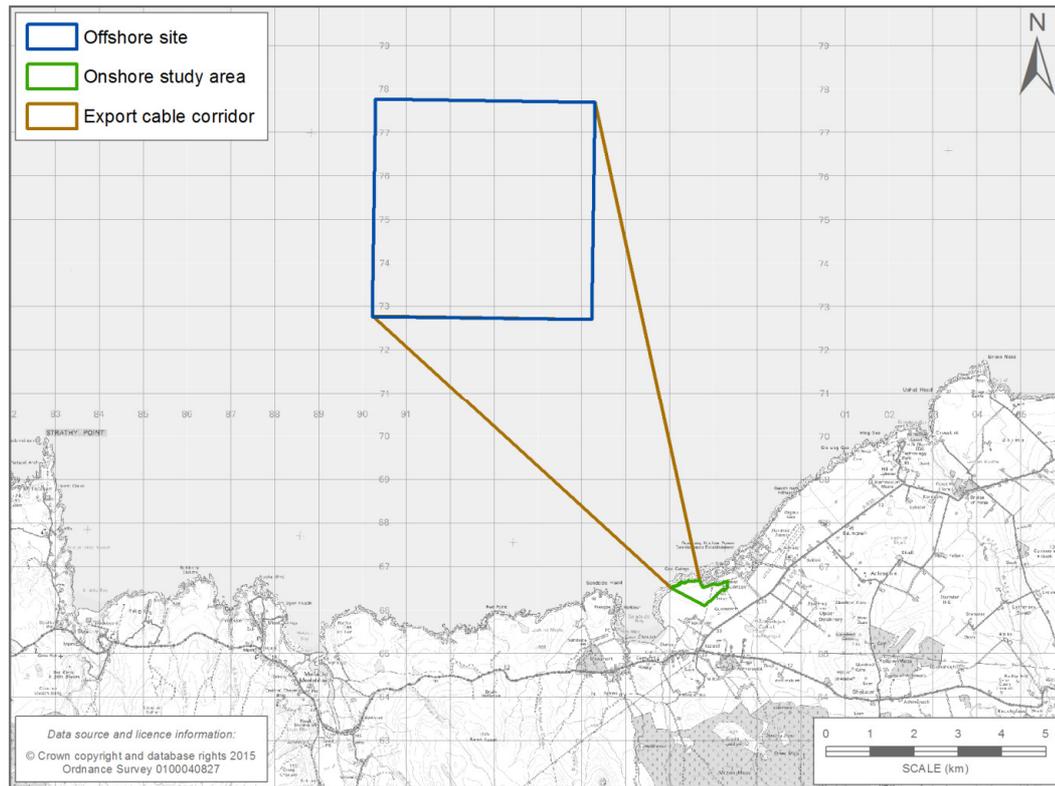
4.1 Regulation 48 of the Habitats Regulations sets out the procedure for the assessment of the implications of plans and projects on European sites. Under Regulation 48, if the proposed development is not directly connected with or necessary to the management of a European site and is likely to significantly affect the site, the competent authority must undertake an Appropriate Assessment of the implications for that site in view of that site's conservation objectives (Regulation 48(1)). The assessment is undertaken as a four stage process:

- Stage 1 Screening - Test of Likely Significance: Determining whether the plan or project "*either alone or in-combination with other plans and projects*" is likely to have a significant effect on a European site(s);
- Stage 2 Appropriate Assessment: Where likely significant effects are identified during screening, determining whether, in view of the European site's conservation objectives, the plan or project would have an adverse effect (or risk of adverse effect) on the integrity of the site. If not, the plan can proceed;
- Stage 3 Alternatives and Compensation: Where the plan or project cannot be shown to avoid an adverse effect on the integrity of a site, there should be an examination of compensation measures and alternative solutions; and
- Stage 4 Assessment of "*imperative reasons of overriding public interest*" (IROPI): If it is not possible to identify mitigation and alternatives that would avoid an adverse effect, it would be necessary to establish IROPI. This is not considered a standard part of the process and will only be carried out in exceptional circumstances.

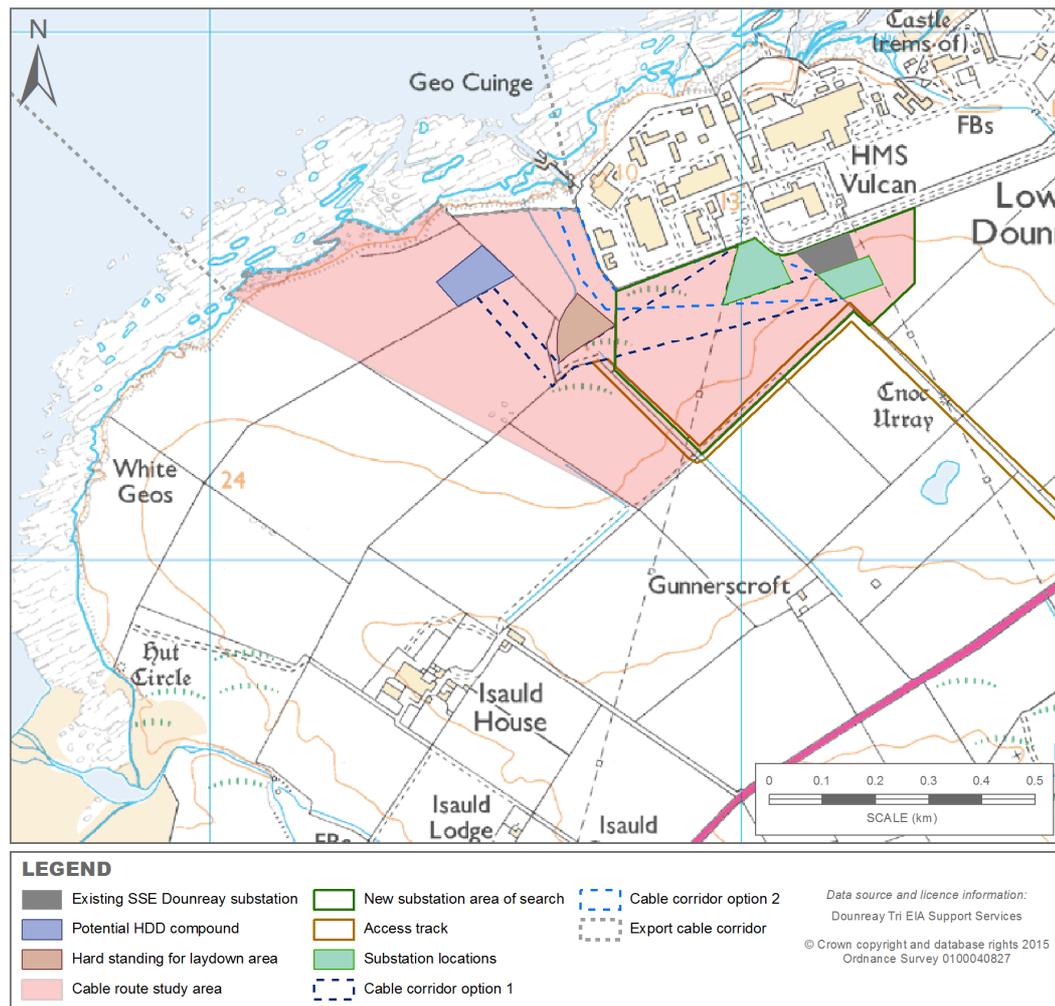
This appraisal is undertaken to provide information for an HRA for Stage 1 and Stage 2 of the HRA process. Relevant information for Stage 3 and Stage 4 of the HRA are outwith the scope of this appraisal.

## 5 The Proposed Development

- 5.1 Details of the proposed development are presented in Chapter 4: *Project Description*. The following summarises the proposed development.
- 5.2 The proposed Dounreay Tri demonstrator project is a floating offshore wind farm comprising two turbines located 6 km off Dounreay, Caithness (Figure 5-1). A single export cable will be installed to the west of the Dounreay Restoration Site fence line and connected to a new on shore sub-station (Figure 5-2).



**Figure 5-1: Offshore site, export cable corridor and onshore study area**



**Figure 5-2: Onshore study area including indicative landfall options, substation options and cable corridors**

**Construction and Operations Programme**

- 5.3 Installation of the offshore infrastructure including cable installation, the mooring system and hook up of the turbines are predicted to be undertaken in Q2 and Q3 2018 and last for a period of approximately six months. Onshore works, including the construction of the substation are predicted to last for up to 12 months, with work commencing in Q3 2013.
- 5.4 Following commissioning of the wind farm in Q3 2018 the wind farm is planned to be operation for 25, with decommissioning forecast to take place in 2043.

**Offshore Infrastructure**

- 5.5 The wind farm will comprise of two turbines, a semi-submersible foundation and mooring clump weight, associated mooring chains and anchors.
- 5.6 The exact turbine specification is still being finalised with options for two 4, 5 or 6 MW turbines. The 6 MW turbines are the largest turbines being considered with a maximum rotor tip height of 201 m above Lowest Astronomical Tide (LAT) and maximum rotor diameter of 154 m. The minimum air draft above LAT is 22 m for all possible turbine options.

- 5.7 The turbines will be installed on the platform and commissioned at the fabrication port, prior to being towed to the offshore Site.
- 5.8 The semi-submersible platform, supporting the two turbines, will be between 195 m - 230 m long and 105 m - 135 m wide depending on the eventual turbines selected. The platform will be towed out to site using four anchor handling vessels and secured to the seabed using up to eight mooring lines anchored on the seabed. The installation of the platform is expected to require up to eight support vessels.
- 5.9 The anchors used to secure the platform to the seabed will each be 9 m x 9 m in size and installed up to 800 m from the platform centre, occupying an area of approximately 2 km<sup>2</sup> on the seabed.

#### ***Export cable***

- 5.10 Between 6 and 13.8 km of export cable will be buried in the seabed between the Site and the landfall to the west of the Dounreay restoration site (Figure 5-2). The cable will be trenched and buried up to 2 m deep. Trenching will be undertaken using either ploughing, jetting or vertical injection, depending on seabed conditions.

#### ***Operations and Maintenance***

- 5.11 Once operational, regular inspections, servicing and maintenance will be required throughout its lifetime. This will require vessel movements to and from the site. The precise number of inspections and associated vessel movements are not known.

#### ***Decommissioning***

- 5.12 At the end of the operational lifetime of the Project in 25 years the wind farm will be decommissioned. It is predicted that decommissioning activities will likely be the reverse of those used during construction.

#### ***Onshore Infrastructure***

- 5.13 The onshore infrastructure shall comprise of cable landfall, and cable joint transition bay, onshore cabling and a substation.
- 5.14 Landfall will occur to the west of Dounreay restoration site and trenched using Horizontal Directional Drilling (HDD) or via an existing cooling water intake at Dounreay Nuclear power station will be used.
- 5.15 Should HDD be undertaken an area of approximately 1,000 m<sup>2</sup> will be impacted and take 1-2 months. Placing duct along an existing cooling water intake will also take 1 -2 months.
- 5.16 The onshore cable will be installed in a trench, 1-2 m deep, along the cable route over a distance of up to 800 m. It is expected that one cable will be installed in a single trench up to 3 m wide with an associated working corridor width of up to 20 m. Once installed the site can be reinstated and re-cultivated. Onshore trenching would take 1-2 months, subject to weather.
- 5.17 The substation will be constructed adjacent to the existing substation onsite. It will impact an area no greater than 50 m x 50 m. Once operational there will be limited activity on site, with an estimated four vehicles per month.
- 5.18 At the time of decommissioning all equipment will be removed using similar methods as used during the installation.

## 6 Possible Impacts on Qualifying Features

6.1 The following section identifies the potential impacts that may arise on qualifying species or habitats from the proposed development.

### Introduction

6.2 Potential impacts on birds that could cause a likely significant effect include:

- Mortality as a result of direct collision with turbines during the operational phase of the development;
- Displacement and disturbance resulting in effective habitat loss from an area around turbines and other offshore (e.g. vessels) and onshore (e.g. vehicles) activities during the construction, operational and decommissioning phases of the project;
- Barrier effects caused by the physical presence of turbines;
- Direct habitat loss during construction, operation and decommissioning.

### Collision Mortality

6.3 It is widely recognised that there is potential for seabirds to collide with operating wind turbines, although the risk of collision with wind turbines depends on a number of variables, in particular, the size and number of turbines, species specific flight heights, avoidance behaviour and the frequency of movements in or near to the turbines. Weather conditions and time of year may also affect the risk of collisions occurring.

6.4 Collision risk only occurs during the operational phase of the wind farm.

6.5 Collision risk modelling (CRM) has been undertaken based on a number of flight height scenarios. The results based on site specific and generic flight height data are presented in Table 6-1. For the purposes of this assessment the worst-case CRM output has been used to assess potential affects from collision on seabirds.

**Table 6-1: Results from collision risk modelling using Band Option 1 and 2 models and site specific and generic data.**

Species	Avoidance rate	Band Option 1				Band Option 2			
		Site specific		Generic		Site specific		Generic	
		Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding	Breeding	Non-breeding
Gannet	0.989	0 (4)	0 (1)	0 (1)	0 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Great skua	0.983	-	-	0 (0)	0 (0)	-	-	0 (0)	0 (0)
Kittiwake	0.989	9 (12)	6 (14)	2 (6)	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)
Herring gull	0.995	-	-	0 (0)	0 (0)	0 (0)	0 (1)	0 (0)	0 (1)
Great black-backed gull	0.995	0 (0)	1 (1)	0 (0)	0 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Arctic tern	0.983	1 (2)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)	0 (0)
Numbers in parenthesis relate to +95% CI									

### ***Displacement and Disturbance***

- 6.8 Displacement impacts can occur during all phases of a project. Vessel activities during construction, operation and decommissioning may cause relatively localised and temporally short-term displacement effects. During the operational phase seabirds may avoid operating wind turbines and therefore effectively be displaced to a lesser or greater extent from suitable habitat (e.g. Diersche and Garthe, 2006). The level of displacement is very species specific and the extent of displacement varies across species with some species showing no evidence of any displacement and others showing levels of displacement out to 2 km (Furness 2016). Displacement caused by the presence of the turbines during the operational phase may occur over a wider area and for a longer duration than displacement that may occur during the construction and decommissioning phases.
- 6.9 Disturbance and displacement have the potential to cause birds to relocate to sites that might be less optimal and therefore cause increased energetic or behavioural demands to the birds and risk increasing mortality or reducing breeding success.
- 6.10 Evidence from existing wind farms and other marine activities suggest that this is potentially a significant effect to divers (e.g. red-throated diver; Norman and Ellis, 2005) and seaduck (e.g. common scoter; Kaiser, 2002). However, very few Divers or seaduck have been recorded in the development area and they are not species of significant concern.
- 6.11 Key species recorded within the offshore site that may be affected by vessel disturbance are the Auks (guillemot, razorbill and puffin).

### ***Barrier Effects***

- 6.12 Birds may avoid flying through wind farms and in doing so detour around a constructed wind farm causing a bird to fly further than it may have otherwise have done so and expend additional energy. This incremental increase in energy expenditure, if great enough, could cause increase risk of mortality or reduced productivity. This is of particular concern should there be regular, daily, movements around an offshore wind farm (i.e., to and from foraging or roosting areas).
- 6.13 Barrier effects only occur once the turbines have been constructed and are therefore present for the duration of the operational period.

### ***Direct Habitat Loss***

- 6.14 The loss of seabed habitat due to installation and operational presence of the wind turbine foundations, in this case anchors, and associated infrastructure, e.g. cables, could cause a negative impact on birds if they require the seabed and associated fauna for prey. This may be particularly the case for seaduck feeding on bivalves (e.g. common scoter; Kaiser *et al.*, 2006).
- 6.15 Of the species regularly recorded within the offshore site, none regularly feed on bivalves or rely upon the seabed features and no likely significant effects are predicted to occur for any qualifying species.

### ***Habitat Formation***

- 6.16 The Dounreay Tri demonstrator project has the potential to create habitat suitable for resting or roosting birds on the semi-submersible platform. It is predicted that it will form a suitable site for Terns and Gulls and could increase their numbers within the area. Similarly, species not recorded during baseline surveys, e.g. shags and cormorants may start occurring more

frequently. This is similar to increases recorded for some species of seabird that use platforms of conventional offshore wind turbine platforms, e.g. Krijgsveld *et al.* 2010. However, the area that may be suitable for roosting could be larger than a single conventional platform and may prove more attractive to birds.

- 6.17 It is not possible to assess what the potential impact might be of attracting birds to the turbines and no assessment has been undertaken. However, it is recognised that it could cause an increase in potential collision risk for birds that regularly fly at rotor height, e.g. large gulls.

#### ***Impact on prey species***

- 6.18 Potential impact on prey species can have an indirect effect on qualifying species. The main impacts on potential prey species arise from either direct physical impacts causing the loss of individuals or suitable habitat and the displacement of prey, usually associated with noise impacts on fish.
- 6.19 The scale of the proposed project is such that there will be very little loss of suitable habitat for prey species and therefore this is not considered a concern for the project. Noise impacts on prey can arise during the construction, operational and decommissioning phases of the project. The most significant effects usually arise during the construction phase, particularly if there is piling. However, there is no piling activities associated with the proposed development and the main noise sources will be from vessel activity. Vessel noise will, if any, have a very localised and temporary effect on possible prey species and is not considered a concern for this project.

#### ***In-combination impacts.***

- 6.20 Under the Habitats Regulations, it is necessary to consider the in-combination effects of development proposals on European Sites. These refer to effects, which may or may not interact with each other, but which could affect the same receptor or interest feature (i.e. a habitat or species for which a European Site is designated).
- 6.21 The in-combination assessment includes developments that are:
- Under construction,
  - Permitted application(s), but not yet implemented,
  - Submitted application(s) not yet determined,
  - Projects identified in the relevant Development Plan (and emerging Development Plans),
  - Sites identified in other policy documents, as development reasonably likely to come forward.
- 6.22 For the purposes of this assessment, on-going impacts from current activities have not been included within the in-combination assessment where the influence of the projects upon a receptor, that may also be predicted to be significantly affected by the development, is considered to be captured within the baseline.
- 6.23 Following advice from SNH (SNH 2016a) and MS-LOT (2016), the following projects have been considered as having potential for an in-combination effect:
- The Orkney-Caithness interconnector cable (*Orkney - Caithness 220 kV Link*),
  - HIE Dounreay Floating Wind Deployment Centre,
  - Brims Tidal Array,

- MeyGen Tidal Array,
- Lashy Sound Tidal Array.
- EMEC Fall of Warness Tidal Test site.

#### ***Orkney - Caithness 220 kV Link***

- 6.24 The Orkney-Caithness 220 kV interconnector cable consists of the construction, installation and operation of a 220 kV subsea cable between Mainland Orkney and the Caithness Coast at East Sandside over a distance of approximately 70 km from directionally drilled landfall points at either end (SSE 2013).
- 6.25 From the Caithness landfall site, the subsea cable route runs north away from the Caithness coast before orientating North-North-East through the waters of the outer Pentland Firth. At approximately 9 km from the Orkney coastline the cable route turns east towards the Orkney coast
- 6.26 The cable will be laid on the seabed and will, wherever possible be trenched and buried to a depth of 1 m. This will cause localised seabed disturbance along a 10 m corridor along the cable route and disturbance to seabirds caused by the physical presence of the vessel.
- 6.27 The environmental assessment identified potential displacement or disturbance effects on seabirds or their prey from the borehole drilling at the landfall locations, cable installation and cable burial. The ES concluded that the effects on birds or their prey would be localised and temporary.
- 6.28 Construction and commissioning of the cables was planned for 2015/16.

#### ***Dounreay Floating Wind Deployment Centre***

- 6.29 The Highland and Islands Enterprise (HIE) Dounreay Floating Wind Deployment Centre is a site being developed to test prototype floating offshore wind technologies. It has a capacity of 30 MW for 5 x 6 MW turbines (4COffshore 2016). However, no information on other plans or projects associated with the Centre are available to undertake an in-combination assessment.

#### ***Brims Tidal Array***

- 6.30 The Brims Tidal Array is located to the south of Hoy and within the Crown Estate's Pentland Firth and Orkney waters strategic Area. The site has a potential maximum capacity of 200 MW.
- 6.31 The tidal array will comprise horizontal tidal turbines placed on the seabed each with a diameter of up to 20 m, and a turbine height of 27 m. Each device will be capable of generating at least 1 MW. Each turbine will be installed and retrieved using a heavy lift barge. Inter-array and export cables will be installed using a cable lay vessel and where suitable the cable will be buried to 1 m to 1.5 m below the seabed (Brims Tidal Array 2013).
- 6.32 The Project consists of the following:
- Offshore tidal generators,
  - Inter-array cables,
  - Potential for offshore hub(s) or substation,
  - Export cable to shore (Hoy or South Walls),
  - Onshore cabling up to onshore substation.
- 6.33 The Project has identified potentially minor impacts from displacement and disturbance during construction, operation and decommissioning phases of the project and changes to

habitat for both onshore and offshore activities during construction and operation. The potential risk of collision with the tidal turbines was unknown (Brims Tidal Array 2013).

- 6.34 The key breeding seabird species identified following one years of surveys were puffin, razorbill, guillemot, puffin and kittiwake.
- 6.35 It is unknown when construction and operation will commence.

**MeyGen**

- 6.36 MeyGen development is located in the Pentland Firth and is a two phase development, with the consented Phase 1 development comprising a maximum of 86 1 MW fully submerged tidal turbines. Phase 2 of the development will be subject to a separate application yet to be made (MeyGen 2012). Consent for Phase 1 was issued in 2013 for the installation of 61 tidal turbines with an initial installation of 4 turbines followed by a period of monitoring (Scottish Government 2013a)
- 6.37 The project comprises a maximum of 86, 1 MW fully submerged tidal turbines in the deep water channel in the Inner Sound of the Pentland Firth. All turbines will be located in water depths of over 31 m at Lowest Astronomical Tide (LAT). The turbines will comprise a rotor and nacelle and will be supported by a turbine supportive structure. The devices will be single rotor, horizontal axis turbines with a rotor diameter of between 16 and 20 m (MeyGen 2012).
- 6.38 Associated with the turbine array will be offshore and onshore infrastructure including subsea cables, landfall cables, power conversion centre and cable connection to the national grid.
- 6.39 Each turbine will have its own dedicated electricity export cable to shore. Cable landfalls will take the form of HDD bores, which will be drilled from onshore. Cables will be laid across the seabed from the turbines to the bores.
- 6.40 Construction is planned to be completed prior to the proposed start of construction at the Dounreay Tri demonstrator project and the potential in-combination impacts will be with the operational phase (MeyGen 2016). The potential in-combination impact from operation of a maintenance vessel once operating at the MeyGen site within the Pentland Firth is predicted to be negligible.
- 6.41 Future construction activities may cause an in-combination impact from noise and vessel movement. However, there is no piling activity associated with the MeyGen development and the main source of noise will be from construction vessels.
- 6.42 Key seabird species identified as being at risk of a likely significant effect were: fulmar, guillemot, razorbill, puffin, kittiwake red-throated diver, Arctic tern, Arctic skua, and gannet. The potential impacts included subsea collisions and disturbance during construction and operation.
- 6.43 Salmon and sea lamprey were both considered to be at risk of a likely significant effect due to collision with the subsea turbines, noise and disturbance arising from construction and operational activities, Electro-magnetic fields and potential barrier effects.
- 6.44 SNH concluded that there was no likely significant effect on grey or harbour seals from the MeyGen development and no Appropriate Assessment was required for these species.
- 6.45 An Appropriate Assessment was undertaken for birds and fish and concluded no adverse effect on the integrity of any of the sites assessed (Scottish Government 2013b).
- 6.46 No in-combination likely significant effect is predicted to occur with the proposed Dounreay Tri demonstrator project and the MeyGen development.

***Lashy Sound Tidal Array***

- 6.47 Scotrenewables Tidal Turbine, propose to develop a tidal array at Lashy Sound between the islands of Eday and Sanday in Orkney. The Agreement for Lease with the Crown Estate for a development of up to 15 turbines (30MW). It is proposed to develop the site in two Phases, Phase 1 up to 5 turbines (10MW) and subject to further environmental assessment, Phase 2 for an additional 10 turbines (20 MW) (Scotrenewables 2014).
- 6.48 The foundations may be installed using a heavy lift barge and the turbines installed using a single multi-cat workboat and connected to the pre-laid anchors and cables.
- 6.49 The project is located approximately 95 km from the proposed Dounreay Tri demonstrator project with mainland Orkney and Hoy lying between them.
- 6.50 The scoping document identifies potential impacts arising from collision with the subsea turbines, disturbance and displacement from construction and operational activities and habitat loss.
- 6.51 No site specific bird or marine mammal data are available within the scoping document to undertake an in-combination assessment. However, the scale of the proposed development and the distance that the tidal array is from the Dounreay Tri demonstrator project indicates that the risk of an in-combination impact likely to cause a significant effect is low.

***EMEC Fall of Warness tidal test site***

- 6.52 The Fall of Warness tidal test site is located to the south-west of the island of Eday, approximately 80 km from the Dounreay Tri demonstrator project. The islands of mainland Orkney and Hoy lie between the two developments.
- 6.53 The test site has been in operation since 2005 and currently provides eight tidal test berths in an area of 2 km by 4 km. There are currently 6 tidal devices being tested within the site. Future expansion of the site will see the number of berths increased from eight to nine with capacity for 12 testing devices (MS-LOT 2015).
- 6.54 Seabirds identified as being at risk from collision include guillemot, razorbill, puffin and gannet (Table 6-2).

**Table 6-2: Estimated number of collisions with the Fall of Warness Test site (Source MS-LOT 2015).**

Species	Assumed Avoidance rate					
	0%	50%	90%	95%	98%	99%
Eider	81.7	40.9	8.2	4.1	1.6	0.8
Red-throated diver	11.4	5.7	1.1	0.6	0.2	0.1
Gannet	1.5	0.8	0.2	0.1	0.0	0.0
Cormorant	80.3	40.1	8.0	4.0	1.6	0.8
Shag	151	75.5	15.1	7.5	3.0	1.5
Guillemot	347	173	35	17	6.9	3.5
Razorbill	4.6	2.3	0.5	0.2	0.1	0.0
Puffin	24.2	12.1	2.4	1.2	0.5	0.2

6.55 The Appropriate Assessment undertaken for the application does not include an in-combination assessment with Dounreay Tri demonstrator project but does consider in-combination impacts with the Meygen development, Beatrice and Moray offshore wind farms and Aberdeen offshore wind farm. The Assessment concludes no likely significant or adverse effects on the integrity of any of the SPAs or SACs considered within the assessment (MS-LOT 2015).

***Other plans or projects***

6.56 It is recognised that that there are other plans or projects that have a theoretical risk of causing an in-combination effect including:

- West Orkney North Wave Energy Project: 50 MW wave energy development and associated onshore infrastructure,
- West Orkney South Wave Energy Project: 50 MW wave energy development and associated onshore infrastructure,
- Marwick Head Wave Energy Project: 50 MW wave energy development and associated onshore infrastructure,
- Costa Head Wave Energy Project: 200 MW wave energy development and associated onshore infrastructure,
- Brough Ness: 100 MW tidal energy development and associated onshore infrastructure,
- Westray South Tidal Energy Project: 200 MW tidal energy development and associated onshore infrastructure.

6.57 However, based on the available information, none of the above projects are likely to cause an in-combination effect that could be significant due to their either their geographical location or, where available, the scale of predicted impact. They are therefore not carried forward in to HRA.

6.58 It is recognised that there is potential for in-combination impacts from other offshore wind farms. For species with extensive foraging ranges during the breeding period, e.g. fulmar, Manx shearwater and gannet there is potential for in-combination impacts with the majority of UK offshore wind farms, with only those in the Southern North Sea being outwith their mean maximum foraging range (e.g. Figure 9-2).

6.59 On-going shipping and fishing activities have the potential to cause in-combination impacts. However, potential impacts from these current activities are captured within the baseline environment and it is not possible to determine what the baseline conditions would be without the impacts that these activities have on the current seabird or marine mammal populations or their prey. Unless it is known of significant increases in activities over and above the historical level of activity it is not possible to include them within any in-combination assessment. There are no known increases in future fishing or shipping activities within the area.

## 7 Designated Sites

- 7.1 The following section summarises the process undertaken in determining which sites should be included within the HRA.
- 7.2 There are a number of SPAs and SACs that have the potential to be impacted by the proposed development. The scope of this assessment is based on the European sites identified within the Scoping document and subsequent consultation and advice received (SNH 2016a; RSPB 2016, Marine Scotland 2016).

### *Special Protection Areas (SPAs)*

- 7.3 Following advice received during consultation (SNH 2016a, RSPB 2016), the geographical scope of this HRA is, with respect to SPAs for breeding seabirds, based on the potential for connectivity during the breeding season between the seabird colony and the proposed development. In order to determine SPA seabird breeding colonies that have potential for connectivity the mean maximum foraging range (+1 s.d.) for each qualifying species has been identified and the qualifying species for sites within that foraging range are considered within the HRA. The mean maximum foraging range for each species is obtained from Thaxter *et al.* (2012), with the exception of great black-backed gull which is from Seys *et al.* 2001 and red-throated diver from SNH (2015b) (Table 7-1).

**Table 7-1: Foraging ranges for breeding seabird species.**

Species	Maximum (km)	Mean maximum (+1 s.d.) (km)	Mean ( $\pm$ s.d.) (km)	Confidence of Assessment
Red-throated diver	13.5	-	-	-
Fulmar	580	645	47.5 $\pm$ 1	Moderate
Manx shearwater	330	330	3.1	Moderate
Storm petrel	>65	-	-	Poor
Leach's petrel	<120	119	-	Poor
Gannet	590	354	92.5 $\pm$ 59.9	Highest
Shag	17	18	5.9 $\pm$ 4.7	Moderate
Arctic skua	75	80	6.4 $\pm$ 5.9	Uncertain
Great skua	219	86	-	Low
Puffin	200	151	4	Low
Razorbill	95	83	23.7 $\pm$ 7.5	Moderate
Guillemot	135	134	37.8 $\pm$ 32	Highest
Arctic tern	30	31	7.1 $\pm$ 2.2	Moderate
Kittiwake	120	83	24.8 $\pm$ 12.1	Highest
Great black-backed gull	60	-	-	-
Herring gull	92	105	10.5	Moderate

- 7.4 For non-seabird species and SPAs for seabirds outwith the breeding season the scope of the HRA is based on the advice received from Scoping (SNH 2016a, RSPB 2016, Marine Scotland 2016). Following the consultation and advice received, the following 32 SPAs have been considered in this HRA (Figure 7-1 and Figure 7-2).

- North Caithness Cliffs,
- Caithness and Sutherland Peatlands,
- Caithness Lochs,
- Hoy,
- Scapa Flow
- East Caithness Cliffs,
- Sule Skerry and Sule Stack,
- Cape Wrath,
- North Orkney
- Marwick Head,
- Rousay,
- Copinsay,
- Handa,
- West Westray,
- Calf of Eday,
- North Rona and Sula Sgeir,
- Troup, Pennan and Lion`s Heads,
- Fair Isle,
- The Shiant Isles,
- Buchan Ness to Collieston Coast,
- Foula,
- Sumburgh Head,
- Fowlsheugh,
- Flannan Isles,
- Rum,
- Noss,
- Fetlar,
- Firth of Forth,
- St Kilda,
- Forth Islands,
- Hermaness, Saxa Vord and Valla Field,
- Mingulay and Berneray,
- Flamborough Head and Bempton Cliffs.

### ***Special Areas of Conservation (SACs)***

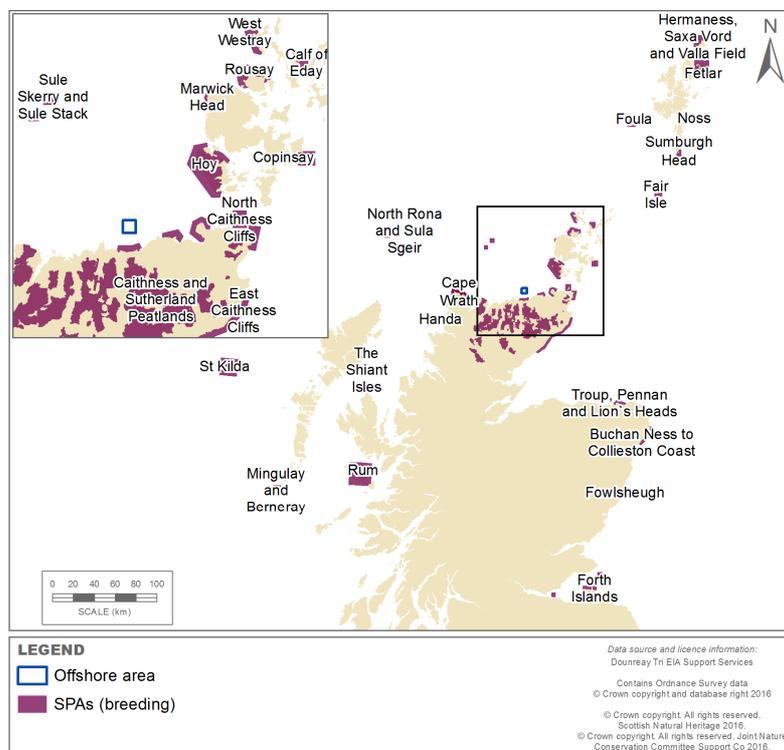
- 7.5 Based on the advice on the Scoping document and subsequent advice received during consultation the following SACs have been considered in the HRA ( Table 7-2 and Figure 7-3).
- Faray and Holm of Faray,
  - North Rona,
  - Sanday,
  - River Thurso,
  - River Borgie,
  - River Naver.
- 7.6 No impacts on qualifying habitats have been identified during any stage of the assessment process and no assessment is made on SAC qualifying habitats in this HRA.

**Table 7-2: SACs taken into consideration within the HRA and qualifying species.**

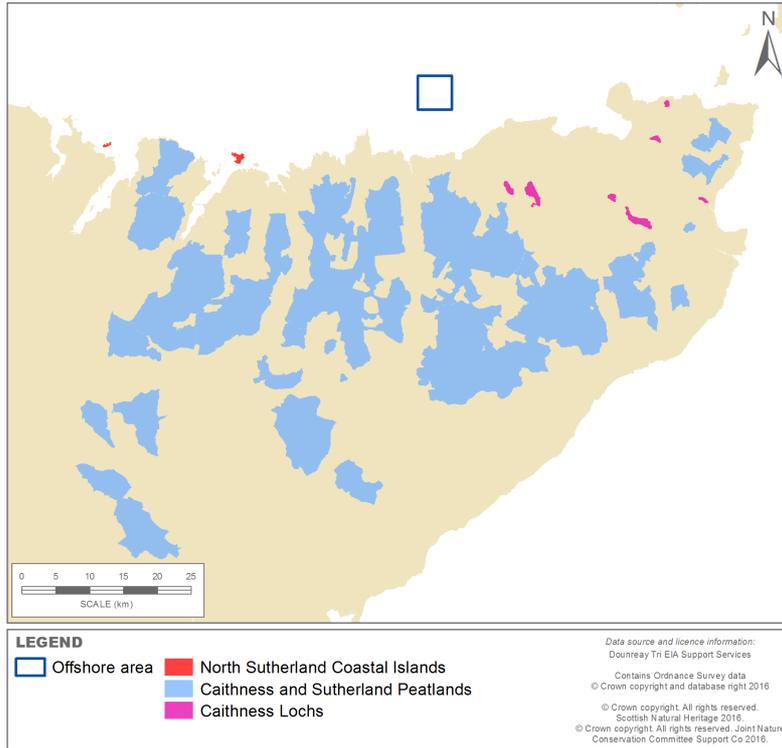
SAC	Approximate Distance from Offshore Area (km)	Qualifying species
Thurso	17	Atlantic salmon
River Naver	23	Atlantic salmon, Freshwater pearl mussel
River Borgie	24	Atlantic salmon, freshwater pearl mussel
Faray and Holm of Faray	81	Grey seal
North Rona	120	Grey seal
Sanday	90	Harbour seal

7.7 Under the Ramsar Convention sites regularly supporting 20,000 waterbirds and/or supporting 1% of the individuals in the population of one species or subspecies of waterbird, can be designated as Ramsar sites. Under UK guidance, sites are, as a matter of policy, afforded the same protection as European designations such as SPAs and SACs. The following Ramsar sites are considered in this assessment:

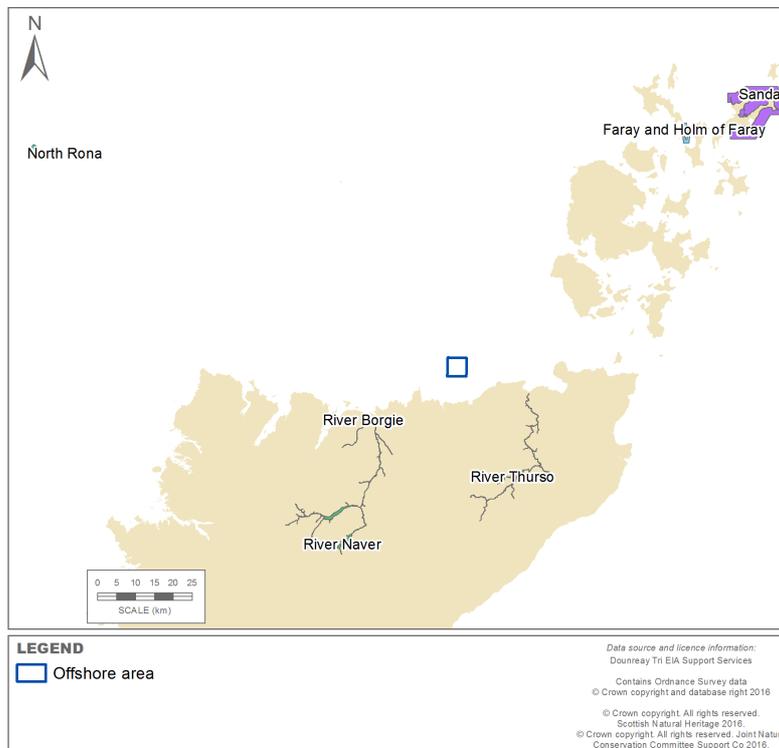
- Caithness Lochs,
- Caithness and Sutherland Peatlands.



**Figure 7-1: SPAs for breeding seabirds considered within the HRA (excluding those for which fulmar is the only relevant qualifying species).**



**Figure 7-2: SPAs for non-seabird species considered in the HRA.**



**Figure 7-3: SACs considered in the HRA.**

7.8 Following advice from SNH that the Pentland Firth and Scapa Flow draft SPA (dSPA) needs to be assessed in the HRA (SNH 2016a). However other draft SPAs also have qualifying features that have the potential to be impacted by the proposed development. These are:

- Outer Firth of Forth and St Andrews Bay Complex dSPA.
- Pentland Firth dSPA

7.9 It is noted that the two draft European Sites have not yet been put forward by Scottish Ministers for public consultation. However, it is envisaged that during 2016 it is likely these site will be one of a number of sites put out for formal public consultation. Once consultation commences the status of the site changes to a potential SPA (pSPA). Under Regulation 10(c) of the The Conservation (Natural Habitats, &c.) Regulations 1994, a European site is *a site hosting a priority natural habitat type or priority species in respect of which consultation has been initiated under Article 5(1)*. Consequently, once consultation has started the site is to be treated in exactly the same way as a Natura 2000 SPA site.

7.10 The sites are included in this assessment to help inform any future potential HRA that may be required. However, it is recognised that both the boundaries and qualifying species of these sites may change during any future consultation process.

7.11 Figures 7-4 to 7-5 present the current site boundaries for the two dSPAs considered in this assessment.

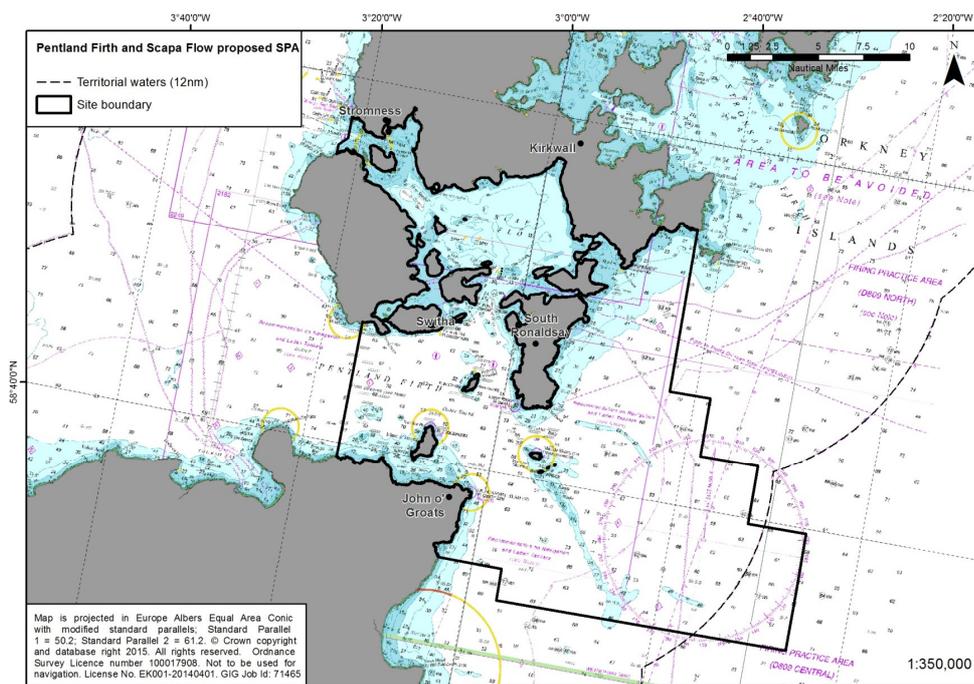
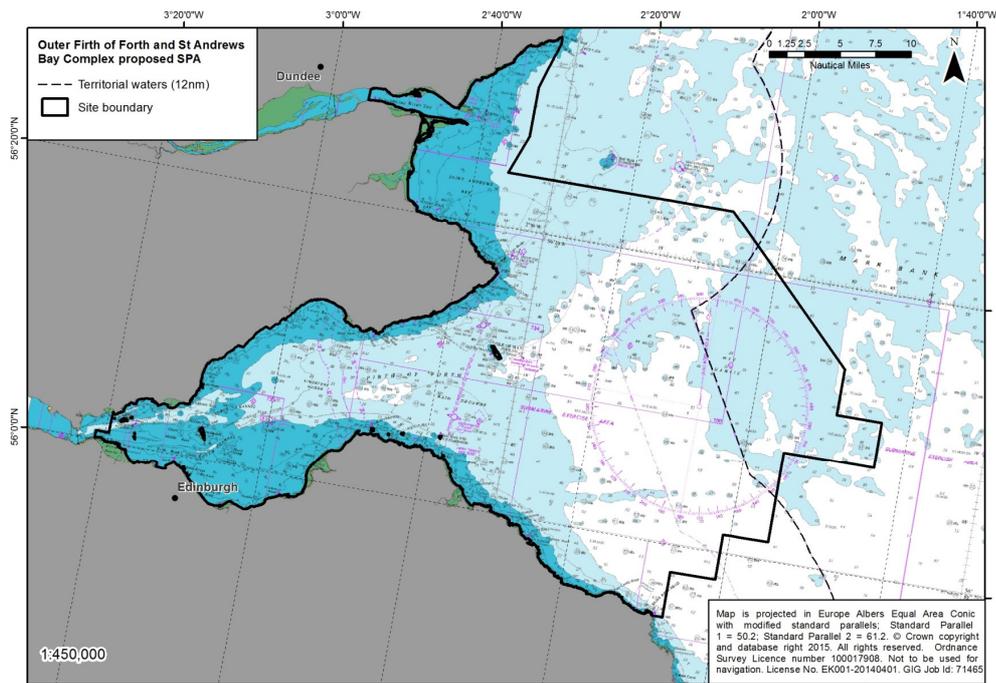


Figure 7-4: Current boundaries of the Pentland Firth dSPA and Scapa Flow pSPA.<sup>1</sup>

<sup>1</sup> Note, there is currently no figure available for the Pentland Firth dSPA alone. Figure presents the combined Pentland Firth dSPA and Scapa Flow pSPA (SNH 2016d).



**Figure 7-5: Current boundaries of the Outer Firth of Forth and St Andrews Bay Complex draft SPA.**

- 7.12 The qualifying features of each site that have potential for connectivity with the proposed development are presented in Table 7-3 to Table 7-6.
- 7.13 The latest breeding population for each of the qualifying seabird species considered in this assessment are presented in Table 7-7 and non-breeding population in Table 7-8.
- 7.14 Outwith the breeding period seabirds occur widely with breeding birds dispersing across the North Sea and migrating southwards as far as the Antarctic. To assess potential impacts from SPA qualifying species as part of a wider seabird population during the non-breeding period the biologically defined minimum population scales (BDMPS) is used (Furness 2015). The biologically defined minimum population (BDMP) for each species during the non-breeding season is presented Table 7-9.

**Table 7-3: SPAs and pSPA considered in HRA and qualifying breeding seabird species within mean maximum foraging range (+1 s.d.).**

(p)SPA	Distance from Offshore Area (km)	Qualifying species within mean maximum foraging range (+1 s.d.)
North Caithness Cliffs	4	Fulmar, Puffin Razorbill, Guillemot, Kittiwake.
Caithness and Sutherland Peatlands	9	Red-throated diver.
Hoy	28	Fulmar, Great skua, Puffin, Guillemot, Kittiwake, Great black-backed gull.
Scapa Flow *	30	Great northern diver, Slavonian grebe, Red-throated diver, Black-throated grebe, Common eider, Long-tailed duck, Goldeneye, Red-breasted merganser, European shag

(p)SPA	Distance from Offshore Area (km)	Qualifying species within mean maximum foraging range (+1 s.d.)
East Caithness Cliffs	47	Fulmar, Puffin, Razorbill, Guillemot, Kittiwake, Herring gull, Great black-backed gull.
Sule Skerry and Sule Stack	50	Gannet, Puffin, Guillemot.
North Orkney *	51	Great northern diver, Slavonian grebe, Common eider, Long-tailed duck, Velvet scoter, Red-breasted merganser, European shag
Cape Wrath	52	Fulmar, Puffin, Razorbill, Guillemot, Kittiwake.
Marwick Head	53	Guillemot, Kittiwake.
Rousay	65	Fulmar, Guillemot.
Copinsay	65	Fulmar, Guillemot, Kittiwake.
Handa	77	Fulmar, Great skua, Razorbill, Guillemot, Kittiwake.
West Westray	78	Fulmar, Puffin, Razorbill, Guillemot, Kittiwake.
Calf of Eday	85	Fulmar, Guillemot, Kittiwake.
North Rona and Sula Sgeir	118	Fulmar, Gannet, Puffin, Guillemot.
Troup, Pennan and Lion`s Heads	134	Fulmar, Guillemot.
Fair Isle	151	Fulmar, Gannet
The Shiant Isles	160	Fulmar.
Buchan Ness to Collieston Coast	174	Fulmar.
Foula	183	Fulmar.
Sumburgh Head	192	Fulmar.
Fowlsheugh	210	Fulmar.
Flannan Isles	214	Fulmar.
Rum	217	Manx shearwater.
Noss	223	Fulmar, Gannet.
Fetlar	262	Fulmar.
Firth of Forth	271	Fulmar.
St Kilda	277	Fulmar, Manx shearwater, Gannet.
Forth Islands	278	Gannet.
Hermaness, Saxa Vord and Valla Field	279	Fulmar, Gannet.
Mingulay and Berneray	295	Fulmar.
Flamborough Head and Bempton Cliffs	543	Fulmar.
<i>* non-breeding populations and or migratory</i>		

**Table 7-4: Non-seabird SPAs considered within the HRA and the qualifying species.**

SPA	Distance from Offshore Area (km)	Qualifying species
North Caithness Cliffs	4	<i>Breeding:</i> Peregrine Falcon.
Caithness and Sutherland Peatlands <sup>1</sup>	9	<i>Breeding:</i> Red-throated diver, Black-throated diver, Wigeon, Common scoter, Golden plover, Greenshank, Dunlin, Wood sandpiper, Golden eagle, Hen harrier, Merlin, Short-eared owl.
Caithness Lochs	13	<i>Non-breeding:</i> Greenland white-fronted goose, Greylag goose, whooper swan.

1. SNH advise that breeding golden plover should be considered within the HRA (SNH 2016a).

**Table 7-5: Draft SPAs taken into consideration within the HRA and the qualifying species.**

Draft SPA	Approximate Distance from Offshore Area (km)	Qualifying species
Pentland Firth dSPA	30	<i>Breeding:</i> Guillemot, Arctic tern, Arctic skua
Outer Firth of Forth and St Andrews Bay Complex dSPA	245	<i>Breeding:</i> Manx shearwater, Gannet.

**Table 7-6: Ramsar sites taken into consideration within the HRA and the qualifying species.**

SPA	Distance from Offshore Area (km)	Qualifying species
Caithness and Sutherland Peatlands	9	<i>Breeding:</i> Greylag goose, Dunlin.
Caithness Lochs	13	<i>Wintering:</i> Greenland white-fronted goose, Greylag goose, Whooper swan.

**Table 7-7: SPA breeding seabird populations within mean maximum (+1 s.d.) foraging distance from the proposed development.**

SPA	Distance from Offshore Area (km)	Fulmar	Red-throated diver	Manx shearwater	Gannet	Great skua	Puffin	Razorbill	Guillemot	Arctic tern	Kittiwake	Herring gull	Great black-backed gull
North Caithness Cliffs	4	14,250	-	-	-	-	7,045	1,700	47,000		10,150		
Caithness and Sutherland Peatlands	9	-	89	-	-	-	-	-	-	-	-	-	-
Hoy	28	19,586	58	-	-	-	417 ind	-	6,300	-	397	-	60
Pentland Firth (dSPA)	30	-		-	-	-	-	-	-	1,000	-	-	-
Scapa Flow	30		80										
East Caithness Cliffs	47	14,202	-	-	-	-	274	12,500	120,789	-	40,410	3,393	175
Sule Skerry and Sule Stack	50	-	-	-	-	-	59,471	-	7,633	-	-	-	-
North Orkney	51		52										
Cape Wrath	52	2,115	-	-	-	-	1,602	2,090	27,359	-	-	-	-
Marwick Head	53	-	-	-	-	-	-	-	11,097	-	526	-	-
Rousay	65	1,030	-	-	-	-	-	-	6,200	-	-	-	-
Copinsay	65	1,630	-	-	-	-	-	-	5,607	-	666	-	-
Handa	77	1,870	-	-	-	135	-	5,165	37,993	-	1,872	-	-
West Westray	78	677	-	-	-	-	-	550	33,900	-	12,055	-	-
Calf of Eday	85	1,842	-	-	-	-	-	-	6,300	-	747	-	-
North Rona and Sula Sgeir	118	1,438	-	-	-	-	5,442	-	3,324	-	-	-	-
Troup, Pennan and Lion`s Heads	134	1,795	-	-	-	-	-	-	10,938	-	-	-	-
Fair Isle	151	29,649	-	-	3,591	-	-	-	-	-	-	-	-

SPA	Distance from Offshore Area (km)	Fulmar	Red-throated diver	Manx shearwater	Gannet	Great skua	Puffin	Razorbill	Guillemot	Arctic tern	Kittiwake	Herring gull	Great black-backed gull
The Shiant Isles	160	4,387	-	-	-	-	-	-	-	-	-	-	-
Buchan Ness to Collieston Coast	174	1,367	-	-	-	-	-	-	-	-	-	-	-
Foula	183	19,758	-	-	-	-	-	-	-	-	-	-	-
Sumburgh Head	192	233	-	-	-	-	-	-	-	-	-	-	-
Fowlsheugh	210	193	-	-	-	-	-	-	-	-	-	-	-
Flannan Isles	214	7,328	-	-	-	-	-	-	-	-	-	-	-
Rum	217	-	-	120,000	-	-	-	-	-	-	-	-	-
Noss	223	5,248	-	-	11,786	-	-	-	-	-	-	-	-
Outer Firth of Forth and St Andrews Bay Complex (dSPA)	245	-	-	3,040	11,680 *	-	-	-	-	-	-	-	-
Fetlar	262	8,912	-	-	-	-	-	-	-	-	-	-	-
Firth of Forth	271	832	-	-	-	-	-	-	-	-	-	-	-
St Kilda	277	66,055	-	4,802	60,290	-	-	-	-	-	-	-	-
Forth Islands	278	-	-	-	75,259	-	-	-	-	-	-	-	-
Hermaness, Saxa Vord and Valla Field	279	6,723	-	-	25,580	-	-	-	-	-	-	-	-
Mingulay and Berneray	295	9,046	-	-	-	-	-	-	-	-	-	-	-
Flamborough Head and Bempton Cliffs	543	878	-	-	11,061	-	-	-	-	-	-	-	-

Note – all counts are of breeding pairs unless indicated by a \*

Source: Furness (2015), JNCC (2016).

**Table 7-8: SPAs non-breeding seabird populations in Orkney and north mainland Scotland.**

SPA	Distance from Offshore Area (km)	Great-northern diver	Black-throated diver	Slavonian grebe	Eider	Velvet scoter	Long-tailed duck	Goldeneye	Red-breasted merganser	Shag
Scapa Flow	30	510	60	140	1,990	-	1,390	220	540	2,930
North Orkney	51	310	-	120	1,453	147	937	-	344	1,742

**Table 7-9: Biologically defined minimum population scales for non-breeding SPA seabirds (Source Furness 2015).**

Species	BDMP	
	Winter / non-breeding	Migration *
Great northern diver	1,000	-
Fulmar	568,736	957,502
Manx shearwater	-	8,507
Gannet	-	456,298 / 248,385
Shag	41,503	-
Arctic skua	-	6,427 / 1,227
Great skua	143	19,556 / 8,485
Puffin	231,957	-
Razorbill	218,622	591,874
Guillemot	1,607,306	-
Arctic tern	-	163,930
Kittiwake		829,937 / 627,816
Great black-backed gull	91,399	-
Herring gull	466,511	-

\*Where two migration periods are defined the BDMP for autumn migration is presented first

## 8 Conservation Objectives

8.1 Each European site has its own conservation objective. For sites considered in this HRA the conservation objectives are common to all SPAs and SACs.

8.2 For SPAs the conservation objectives are:

*To ensure that site integrity is maintained by:*

- i. Avoiding deterioration of the habitats of the qualifying species.*
- ii Avoiding significant disturbance to the qualifying species.*

*To ensure for the qualifying species that the following are maintained in the long term:*

- iii Population of the bird species as a viable component of the SPA.*
  - iv Distribution of the bird species within the SPA.*
  - v Distribution and extent of habitats supporting the species.*
  - vi Structure, function and supporting processes of habitats supporting the species.*
- repeat of ii No significant disturbance of the species.*

SNH (2016a)

8.12 For SACs the conservation objectives are:

### **SACs for Marine Mammals**

*To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and*

*To ensure for the qualifying species that the following are maintained in the long term:*

- i. Population of the species as a viable component of the site;*
- ii. Distribution of the species within site;*
- iii. Distribution and extent of habitats supporting the species;*
- iv. Structure, function and supporting processes of habitats supporting the species; and*
- v. No significant disturbance of the species.*

**SAC for Migratory Fish and Freshwater Pearl Mussels**

- (i) to avoid deterioration of the habitats of the qualifying species or (ii) significant disturbance to them, thus ensuring that the integrity of the SAC is maintained and that they make an appropriate contribution to achieving favourable conservation status for each species; and

To ensure for each species that the following are maintained in the long term:

- (iii) Population of the species, including range of genetic types for salmon, as a viable component of the SACs.
- (iv) Distribution of the species within sites.
- (v) Distribution and extent of habitats supporting each species.
- (vi) Structure, function and supporting processes of habitats supporting each species. repeat of (ii) No significant disturbance of the species. And for freshwater pearl mussel in particular, to ensure that the following are maintained in the long term:
  - (vii) Distribution and viability of freshwater pearl mussel host species
  - (viii) Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

8.15 Conservation objectives outline the desired state for any European site, in terms of the features for which it has been designated. If these features are being managed in a way, which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on the integrity of a site is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation

8.16 The purpose of an HRA is to determine whether a plan or project adversely affects a site's integrity. The critical consideration in relation to site integrity is whether the plan or project affecting a site, either individually or in combination, affects the site's ability to achieve its conservation objectives and favourable conservation status.

## 9 Habitats Regulations Appraisal: SPAs

- 9.1 The purpose of the screening assessment is to determine whether there is the likelihood of a potentially significant effect on the qualifying features of a European site in light of its conservation objectives and characteristics and specific environmental conditions (EC 2010).
- 9.2 The assessment removes from the HRA those proposals (plans or projects) which clearly have no connectivity to SPA qualifying interests or where it is very obvious that the proposal will not undermine the conservation objectives for these interests, despite a connection (SNH 2016a).
- 9.3 In order to determine whether there is a potential for a likely significant effect a judgement is required as to whether any of the SPA conservation objectives might be undermined. Such judgement is based on a simple consideration of the importance of the area in question for the relevant species. Understanding the behavioural ecology of the species, and the characteristics and context of the project, will help in determining whether there are likely significant effects (SNH 2016a).
- 9.4 There are three possible conclusions for this step of HRA:
- The likely impacts are such that there is clear potential for the conservation objectives to be undermined – conclude likely significant effect;
  - The likely impacts are so minimal (either because the affected area is not of sufficient value for the birds concerned or because the risk to them is so small) that the conservation objectives will not be undermined – conclude no likely significant effect
  - There is doubt about the scale of the likely impacts in terms of the conservation objectives – conclude likely significant effect
- 9.5 In determining whether the impacts associated with proposed development may cause a likely significant effect, this assessment has been based on whether construction, operation or decommissioning activities are likely to undermine the conservation objectives of the site (EC 2010).
- 9.6 For the purposes of the assessment the reasoning for the judgements of no likely significant effect for European sites are determined by:
- Whether the qualifying species were not recorded during the site specific surveys and, based on all other evidence it is reasonable to presume their absence;
  - Whether qualifying breeding species are beyond the mean maximum foraging range (+1 s.d.) during the breeding period;
  - Predicted number of collisions are such that the risk of an impact is low;
  - The numbers predicted to be impacted are relatively very small compared with the site's current population and are considered to be inconsequential.
- 9.7 An Appropriate Assessment is required where likely significant effects on European site(s) exist, alone or in combination with other plans or projects.
- 9.8 Information is provided on each of the qualifying species of the designated sites identified where there is potential likely significant effect. The information presented is to enable the competent authority to undertake an Appropriate Assessment.
- 9.9 The following section identifies all relevant qualifying species identified as potentially occurring within the site from the SPAs identified in Section 7 and undertakes an assessment for Likely Significant Effects and, if required Appropriate Assessment.

- 9.10 For SPAs for which breeding birds are a qualifying feature, effects have been considered for the breeding season only. Outwith the breeding period it is not known whether seabirds occurring within the proposed development area are from an SPA or, if so, which site. It is therefore not possible to determine any connectivity with breeding seabird SPAs during the non-breeding period.
- 9.11 During the breeding period seabirds outwith the mean maximum foraging range (+1 s.d.) are recognised to be at very low risk of interacting with the proposed development and therefore will not be affected. Consequently, breeding seabirds at SPAs beyond the mean maximum foraging range (+1 s.d.) are screened out of this HRA.
- 9.12 Qualifying species identified for their non-breeding populations are also assessed.
- 9.13 Based on the information presented in Chapter 11 (Ornithology) the risk of potential impacts likely to cause a significant effect on the qualifying species identified in Tables 7-2 to 7-5 are addressed below.

### Habitats Regulations Appraisal: SPA Qualifying Species

#### Whooper swan (*Cygnus cygnus*)

- 9.14 The whooper swan is a qualifying species for the Caithness Lochs SPA and Ramsar for non-breeding season.
- 9.15 No whooper swans were recorded during the baseline surveys. The Caithness Lochs SPA lies 13 km from proposed development area. The onshore area is not used by whooper swan with the main wintering sites to the east of the proposed development (Patterson *et al.* 2013) and therefore there is very low risk of any disturbance arising from the onshore activities.
- 9.16 Whooper swans breed in Iceland and winter in Britain and Ireland. During migration, to or from their breeding grounds, there is a risk of collision with the proposed turbines.
- 9.17 The mean flight heights of whooper swans migrating overland is 82 m ( $\pm 9$  m) and over water is 31 m ( $\pm 3$  m) above sea level (Griffin *et al.* 2011). They are therefore at risk of collision with offshore wind turbines.
- 9.18 The cited wintering population for the Caithness Lochs SPA is 240 birds and they occur widely across the SPA and the surrounding area (Patterson *et al.* 2013). It is predicted that the whooper swans will migrate across a relatively broad area and relatively few will migrate in proximity of the wind turbines.
- 9.19 No site-specific collision risk modelling has been undertaken for this proposed development. However, modelling undertaken for other, significantly larger wind farms, have indicated a very low risk of collision mortality occurring. For example, the Walney and West of Duddon Sands wind farms, in the Irish Sea, undertook collision risk modelling for a combined total of 291 turbines and a wind farm width of 10 km. In order for there to be one collision per year, with a 98% avoidance rate, the modelling indicated that there had to be 99 flights at rotor height (DONG 2006). Although recognising that this is for two different sites, the modelling still demonstrates that for a similar level of impact to arise from the two turbines at the proposed development a significantly higher number of flights per year at rotor height will be required. The risk of any impact occurring with the two turbines is considered to be very low.
- 9.20 There is a theoretical in-combination impact with other offshore and onshore wind farms. However, the risk of any impact from the proposed project is negligible and no in-combination impacts are predicted to occur.

9.21 The potential impacts on whooper swan from the proposed Dounreay Tri demonstrator project alone or in-combination will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Greenland white-fronted goose (*Anser albifrons flavirostris*)**

9.22 The Greenland white-fronted goose is a qualifying species for the Caithness Lochs SPA and Ramsar for non-breeding season.

9.23 No Greenland white-fronted geese were recorded during the baseline surveys. The Caithness Lochs SPA lies 13 km from proposed development area. The onshore area is not used by Greenland white-fronted geese with the main wintering sites to the east of the proposed development (Patterson *et al.* 2013) with the nearest recorded wintering records 1.5 km away in 1979.

9.24 Observations from the closest wintering roost site at Broubster Loch located approximately 10 km to the south-east of the onshore works indicate that birds fly to the north and east, with the closest regular feeding areas approximately 6 km away from the onshore development area (Patterson *et al.* 2013).

9.25 Greenland white-fronted geese are highly faithful to their wintering sites and therefore it is considered unlikely that birds will move their feeding areas to make regular use of the current onshore project area (Warren *et al.* 1992). There is therefore a very low risk of any disturbance arising from the onshore activities.

9.26 Greenland white-fronted geese breed in west Greenland and migrate, via Iceland, to winter in Britain and Ireland. During migration, to or from their breeding grounds, there is a risk of collision with the proposed turbines.

9.27 On migration, Greenland white-fronted geese are known to fly at rotor height, often between 50 m and 150 m (Griffin *et al.* 2011). However, geese are recognised to have a relatively high avoidance rate of wind turbines, with recommended avoidance rates for use in collision risk model of 99.8% (SNH 2013a). This level of avoidance behaviour is supported by studies undertaken at offshore wind farms indicating that 90% of migrating flocks of pink-footed geese avoided the turbines by increasing flight height altitude and 56.7% by changing course. Overall, 94.5% of geese exhibited some form of macro avoidance behaviour (Plonczier & Simms 2012). Similar studies at other offshore wind farms have reported similar high levels of avoidance and very low risk of collision.

9.28 It is not known what proportion of white-fronted geese wintering within the Caithness Lochs SPA will pass near to the proposed demonstrator project during migration. However, it is predicted that migration to or from the SPA will be over a relatively broad front and that the majority of birds will not pass near to the turbines. Those that do will have a very high level of avoidance. Consequently, there is a very low risk of any collision mortality from the two proposed turbines.

9.29 There is a theoretical in-combination impact with other offshore and onshore wind farms. However, the location of the SPA in relation to other offshore wind farms indicates that there is a low risk of any in-combination impact. The risk of any impact from the proposed project is negligible and no in-combination impacts are predicted to occur.

9.30 The potential impacts on Greenland white-fronted geese from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Greylag goose (*Anser anser*)**

- 9.31 The greylag goose is a qualifying species for the Caithness Lochs SPA and Ramsar and the Caithness and Sutherland Peatlands Ramsar for breeding season.
- 9.32 No greylag geese were recorded during the baseline surveys. The Caithness Lochs SPA lies 13 km from proposed development area and the Caithness and Sutherland Peatlands 9 km. The onshore area is not used by greylag geese with the main wintering sites to the east of the proposed development (Patterson *et al.* 2013) and therefore there is very low risk of any disturbance arising from the onshore activities.
- 9.33 Observations from the closest wintering roost site for greylag goose at Broubster Loch located 10 km to the south-east of the proposed development indicate that birds fly to the north and east, with the closest regular feeding areas approximately 4 km away from the onshore development area (Patterson *et al.* 2013).
- 9.34 The breeding population of greylag geese within the Caithness and Sutherland Peatlands Ramsar site are 9 km from the proposed development and will not occur in the area during the breeding period. During the non-breeding period it is not known if they remain in the area with other wintering greylag geese or migrate southwards. Should they winter in the area, they winter in main locations to the east of proposed development.
- 9.35 Greylag geese breeding in Iceland and wintering in Britain and Ireland. During migration, to or from their breeding grounds, there is a risk of collision with the proposed turbines.
- 9.36 Geese are recognised to have a relatively high avoidance rate of wind turbines, with recommended avoidance rates for use in collision risk model of 99.8% (SNH 2013a). This level of avoidance behaviour is supported by studies undertaken at offshore wind farms indicating that 90% of migrating flocks of pink-footed geese avoided the turbines by increasing flight height altitude and 56.7% by changing course. Overall, 94.5% of geese exhibited some form of macro avoidance behaviour (Plonczier & Simms 2012). Similar studies at other offshore wind farms have reported similar high levels of avoidance and very low risk of collision.
- 9.37 It is not known what proportion of greylag geese wintering within the Caithness Cliffs SPA will pass near to the proposed demonstrator project during migration. However, it is predicted that migration to or from the SPA will be over a relatively broad front and that the majority of birds will not pass near to the turbines. Those that do will have a very high level of avoidance. Consequently, there is a very low risk of any collision mortality from the two proposed turbines.
- 9.38 There is a potential in-combination impact with other offshore and onshore wind farms. However, the location of the SPA in relation to other offshore wind farms indicates that there is a low risk of any in-combination impact with offshore development. No greylag geese were recorded at the offshore or onshore sites and the risk of any impact from the proposed project is negligible and no in-combination impacts are predicted to occur.
- 9.39 The potential impacts on greylag geese from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Wigeon (*Anas penelope*)**

- 9.40 The wigeon is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.

- 9.41 No wigeon were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary. During the breeding season wigeon will likely remain near their breeding sites within the SPA and not forage offshore nor at the onshore site. There will be no disturbance to breeding wigeon within the SPA.
- 9.42 No impacts are predicted to occur to wigeon during the breeding period. Consequently, there will be no in-combination effects.
- 9.43 The potential impacts on wigeon from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Common eider (*Somateria mollissima*)**

- 9.44 The common eider is a qualifying species for the Scapa Flow pSPA and North Orkney pSPA for the non-breeding period.
- 9.45 No common eiders were recorded during the baseline surveys. The Scapa Flow pSPA lies c. 30 km from proposed development and the North Orkney pSPA lies c. 51 km away. There will be no disturbance or displacement of common eider within the pSPAs.
- 9.46 No impacts are predicted to occur to common eider during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.47 The potential impacts on common eider from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Long-tailed duck (*Clangula hyemalis*)**

- 9.48 The long-tailed duck is a qualifying species for the Scapa Flow pSPA and North Orkney pSPA for the non-breeding period.
- 9.49 No long-tailed duck were recorded during the baseline surveys. Scapa Flow pSPA and the North Orkney pSPA lay c. 30 km and c. 51 km from proposed development respectively. There will be no disturbance or displacement of long-tailed duck within the pSPAs.
- 9.50 No impacts are predicted to occur to long-tailed duck during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.51 The potential impacts on long-tailed duck from the proposed Dounreay Tri demonstrator, project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Common scoter (*Melanitta nigra*)**

- 9.52 The common scoter is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.53 No common scoters were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary. During the breeding season common scoter nest on fresh water lochs and although there may be inter-loch movements, particularly by males in the spring, they remain within the breeding areas. It is

therefore predicted that common scoter will not occur at the offshore or onshore sites. There will be no disturbance to breeding common scoter within the SPA.

- 9.54 No impacts are predicted to occur to common scoter during the breeding period. Consequently, there will be no in-combination effects.
- 9.55 The potential impacts on common scoter from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Velvet scoter (*Melanitta fusca*)**

- 9.56 The velvet scoter is a qualifying species for the North Orkney pSPA for the non-breeding period.
- 9.57 No velvet scoters were recorded during the baseline surveys. The North Orkney pSPA lies c. 51 km from proposed development. There will be no disturbance or displacement of velvet scoter within the pSPA.
- 9.58 No impacts are predicted to occur to velvet scoter during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.59 The potential impacts on velvet scoter from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Goldeneye (*Bucephala clangula*)**

- 9.60 The goldeneye is a qualifying species for the Scapa Flow pSPA for the non-breeding period.
- 9.61 No goldeneye were recorded during the baseline surveys. The Pentland Firth and Scapa Flow dSPA lies c. 30 km from proposed development area. There will be no disturbance or displacement of goldeneye within the pSPA.
- 9.62 No impacts are predicted to occur to goldeneye during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.63 The potential impacts on goldeneye from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Red-breasted merganser (*Mergus serrator*)**

- 9.64 The red-breasted merganser is a qualifying species for the Scapa Flow pSPA and North Orkney pSPA for the non-breeding period.
- 9.65 No red-breasted mergansers were recorded during the baseline surveys. The Scapa Flow pSPA and the North Orkney pSPA lie c. 30 km and c. 51 km from proposed development respectively. There will be no disturbance or displacement of red-breasted merganser within the pSPA.
- 9.66 No impacts are predicted to occur to red-breasted merganser during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.67 The potential impacts on red-breasted merganser from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the

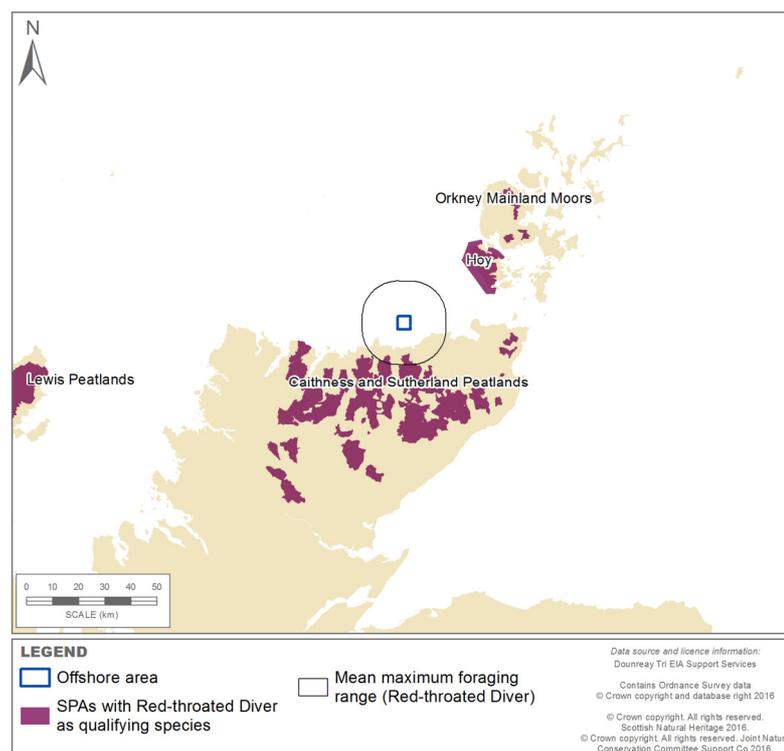
species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Red-throated diver (*Gavia stellata*)**

9.68 During the breeding season red-throated diver is a qualifying species for the following sites:

- Caithness and Sutherland Peatlands SPA,
- North Orkney pSPA,
- Scapa Flow pSPA,
- Hoy SPA.

9.69 The maximum foraging range for red-throated diver is generally less than 8 km, although flights of up to 13.5 km have been reported (SNH 2013b). For the purpose of this assessment all SPAs for which red-throated diver is a qualifying species during the breeding season within 13.5 km have been considered (Figure 9-1). During the breeding season the red-throated diver is a qualifying species for the Caithness and Sutherland Peatlands SPA. However, this site is beyond 8 km from the proposed development and therefore beyond the general maximum foraging distance for red-throated diver. The Hoy SPA, North Orkney and Scapa Flow pSPAs are beyond the mean maximum foraging range for red-throated diver.



**Figure 9-1: SPAs with breeding red-throated diver as a qualifying species and maximum foraging range.**

9.70 Only two red-throated divers were recorded during baseline surveys. One was recorded in June, flying west at height of at a height of 13 m and another was recorded sitting on the water in September (HiDef 2015). The peak population estimate is three birds.

9.71 Red-throated divers fly relatively low to the sea surface with 6.2% recorded as flying at collision risk heights (Johnston *et al.* 2014). There is a very low risk of any collisions occurring.

- 9.72 There is strong and consistent evidence of red-throated divers displaced by offshore wind farm out to a distance of 2 km or more (Furness 2016). Displaced birds can relocate to other locations if suitable habitat is available. The site is of very low importance for red-throated diver and the area of potential displacement is small. Any displaced birds will be able to relocate to other areas. The Pentland Firth and Scapa Flow draft SPA is located approximately 30 km away and therefore no displacement impact will occur to birds within the site.
- 9.73 If a barrier effect occurs, birds will be able to fly around the two turbines without any effect.
- 9.74 It is recognised that red-throated divers are sensitive to disturbance from boats and it is expected that any red-throated diver in or near to the paths of boats associated with the proposed project would be displaced (Furness & Wade 2012). Studies undertaken in the Thames indicate varying degrees of displacement at distances up to and beyond 1 km (Norman & Ellis 2005). Very few red-throated diver were recorded in the area and any disturbance effects will be localised and temporary. Birds displaced due to disturbance will be able to relocate following the departure of any vessels.
- 9.75 The onshore connection of the Orkney-Caithness 220 kV interconnector cable will be at East Sandside and within the maximum foraging range for breeding red-throated divers. There will be some vessel disturbance during the cable laying and landfall operations that could impact on red-throated divers. The duration of activities that could cause disturbance is unknown but is predicted to be of a relatively short duration (SSE 2013). Any displacement or disturbance impacts in-combination with any potential Dounreay Tri related disturbance will be localised and temporary. Birds will be able to relocate elsewhere to suitable foraging locations and return once the construction activity has been completed. No in-combination likely significant effect is predicted to occur.
- 9.76 The potential impacts on red-throated diver from the proposed Dounreay Tri demonstrator, alone or in-combination, project will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Black-throated diver (*Gavia arctica*)**

- 9.77 Black-throated diver is a qualifying species for the Caithness and Sutherland Peatlands SPA for the breeding period where its population is considered to be unfavourable and declining and also the Scapa Flow pSPA for the non-breeding period.
- 9.78 No black-throated divers were recorded during the baseline surveys. The Scapa Flow dSPA lies approximately 30 km from proposed development and there will be no disturbance or displacement of black-throated divers within the pSPA.
- 9.79 No impacts are predicted to occur to black-throated diver during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.80 The potential impacts on black-throated diver from the proposed Dounreay Tri demonstrator project either alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Great northern diver (*Gavia immer*)**

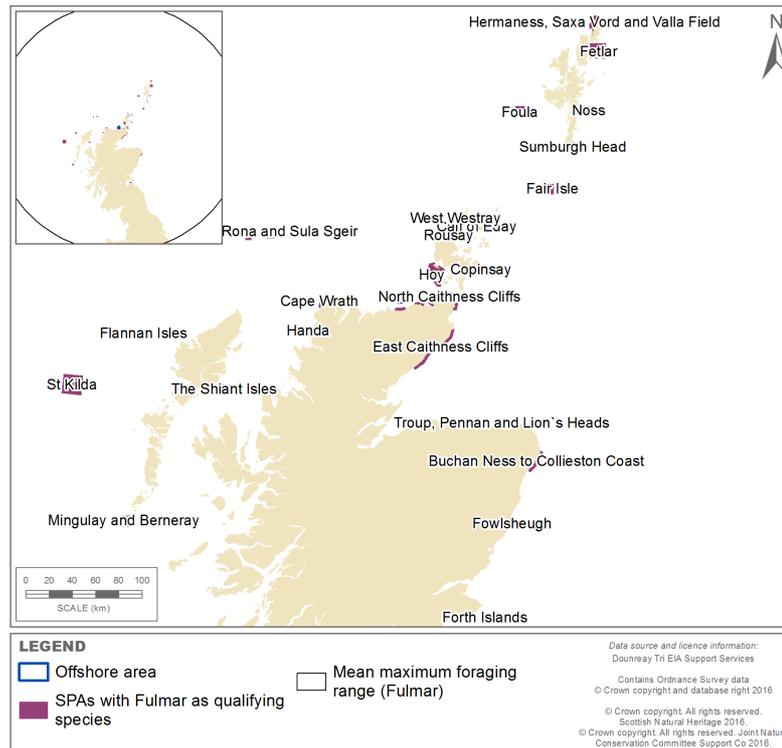
- 9.81 Great northern diver is a qualifying species for the the Scapa Flow pSPA and North Orkney pSPA for the non-breeding period.

- 9.82 No great northern divers were recorded during the baseline surveys. The Scapa Flow pSPA lies approximately 30 km from proposed development and North Orkney approximately 51 km and there will be no disturbance or displacement of great northern divers within the pSPAs.
- 9.83 No impacts are predicted to occur to great northern diver during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.84 The potential impacts on great northern diver from the proposed Dounreay Tri demonstrator project either alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Fulmar (*Fulmarus glacialis*)**

- 9.85 During the breeding season the fulmar is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 645 km (Thaxter *et al* 2012) (Figure 9-2).

- North Caithness Cliffs,
- Hoy,
- East Caithness Cliffs,
- Cape Wrath,
- Rousay,
- Copinsay,
- Handa,
- West Westray,
- Calf of Eday,
- North Rona and Sula Sgeir,
- Troup, Pennan and Lion`s Heads,
- Fair Isle,
- The Shiant Isles,
- Buchan Ness to Collieston Coast,
- Foula,
- Sumburgh Head,
- Fowlsheugh,
- Flannan Isles,
- Noss,
- Fetlar,
- Firth of Forth,
- St Kilda,
- Forth Islands,
- Hermaness, Saxa Vord and Valla Field,
- Mingulay and Berneray,
- Flamborough Head and Bempton Cliffs.



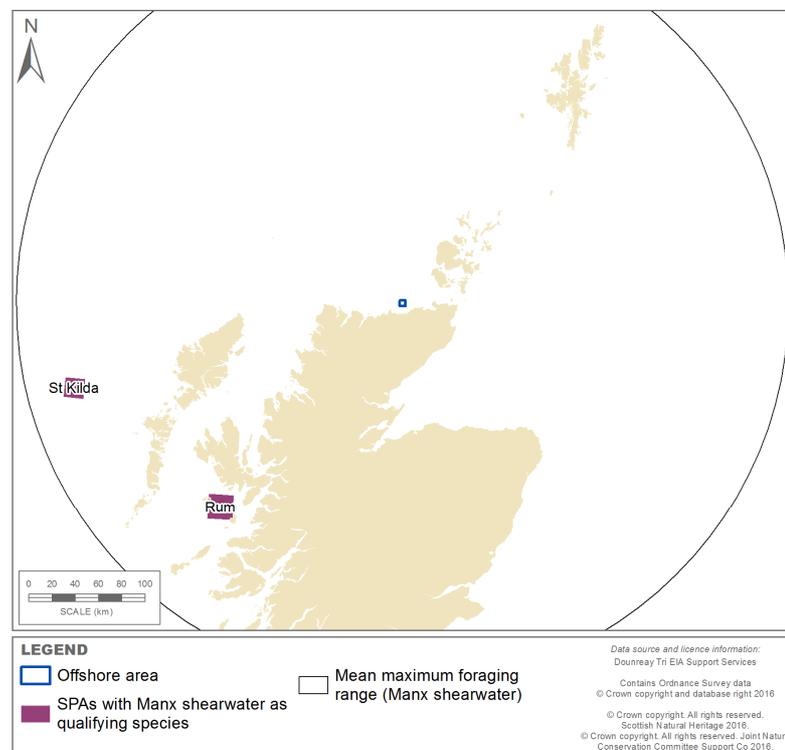
**Figure 9-2: SPA for which breeding fulmar is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.86 Fulmars were recorded regularly throughout the survey period. Although the numbers recorded were generally higher during the winter period, peak numbers occurred in August when a density of 24 birds/km<sup>2</sup> were recorded over the wider study area, which equates to 1,863 birds. Within the project site densities were lower and peaked in August at 2 birds/km<sup>2</sup>.
- 9.87 Results from site specific monitoring indicate that 99.1% of all flights were below 22 m and therefore below turbine height (HiDef 2015). Consequently, there is a very low risk of a collision impact.
- 9.88 Fulmars have extensive foraging ranges during the breeding period, with a mean maximum foraging range of 645 km (+1 s.d.) (Thaxter *et al* 2012). In the event of any possible barrier effect occurring, any increase in flight distance around Dounreay Tri will be negligible compared to the overall distance fulmar's fly during a single foraging trip.
- 9.89 There is limited evidence that there may be displacement impacts on fulmars from operating offshore wind farms. At Egmond Aan Zee the only survey with a large enough sample size reported no clear influence on the wind farm (Leopold *et al.* 2010). Elsewhere, fulmars have been reported flying around wind farms and reduced numbers have been recorded (Diersche & Garthe 2006; Barton *et al.* 2009). Consequently, there may be a low-level displacement effect on fulmars.
- 9.90 A peak density of fulmar within the study area was 24 birds/km<sup>2</sup> in August 2015. This was significantly higher than any other month, with the next highest density being 2.95 birds/km<sup>2</sup> (HiDef 2015). Should displacement occur, and a worst-case scenario of all birds being displaced within 1 km of the project, then a maximum of 75 fulmars may be displaced. Displaced birds will relocate to other locations and although there is a risk of causing intra-specific competition or an increase in energetic expenditure the displacement of up to 75 birds will not cause any levels of impact that could cause an impact for a species that is not limited by habitat or suitable resources and has a very extensive foraging range.

- 9.91 Fulmars are not sensitive to disturbance (Furness & Wade 2012) and the presence of vessels and other project related activities during installation, maintenance, or decommissioning will have a localised and temporary effect. Any birds displaced due to the disturbance will be able to relocate into suitable areas.
- 9.92 During the non-breeding period an estimated 568,735 fulmars winter in the North Sea and 957,502 occur during migration, of which approximately 50% may be from UK SPAs. The possible impact on 75 fulmars out of a wintering or migrating population in excess of 500,000 birds will not cause a likely significant or adverse effect.
- 9.93 The extensive foraging range of breeding fulmars indicate that there is potential for interactions with offshore wind farms across most of the central and Northern North Sea and Irish Sea. However, aside from possible localised displacement effects, no offshore wind farms have identified any impacts on fulmars. Consequently, no in-combination impacts are predicted to occur.
- 9.94 The potential impacts on fulmar from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Manx shearwater (*Puffinus puffinus*)**

- 9.95 The Manx shearwater is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 330 km (Thaxter *et al* 2012) (Figure 9-3):
- Rum,
  - St Kilda,
  - Outer Firth of Forth and St Andrews Bay Complex (dSPA).



**Figure 9-3: SPAs for which breeding Manx shearwater is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.96 A total of four Manx shearwaters were recorded during the site-specific baseline surveys, with four recorded on the water during July.
- 9.97 Manx shearwaters are at very low risk of collision with Johnston *et al.* (2014) indicating no risk of collision. Elsewhere up to 0.5% of flights have been recorded as being at collision risk (DONG 2013). The risk of any impact from collision on Manx shearwater from the proposed development is extremely low.
- 9.98 If displacement does occur around the two turbines birds will be able to relocate elsewhere and the proportion of area from which they may be displaced is negligible compared to their overall foraging range of 330 km.
- 9.99 Should a barrier effect occur the effect on a species of bird that forages over an extensive area will be negligible.
- 9.100 Should there be any disturbance to Manx shearwaters they will be able to relocate elsewhere in suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels.
- 9.101 No Manx shearwaters were recorded during the non-breeding period and therefore no impact is predicted to occur on the North Sea BDMP migration population of 8,507 individuals.
- 9.102 The extensive foraging range of Manx shearwaters indicate that there is potential for interactions with many offshore wind farms across Scottish waters. However, only four Manx shearwaters were recorded during site-specific baseline surveys and no impacts are predicted to occur that could cause an in-combination likely significant effect.
- 9.103 The potential impacts on Manx shearwater from the proposed Dounreay Tri demonstrator project, alone and in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Storm petrel (*Hydrobates pelagicus*).**

- 9.104 During the breeding season the storm petrel is a qualifying species for the following SPA within its maximum foraging range of >65 km (Thaxter *et al* 2012):
- Sule Skerry and Sule Stack.
- 9.105 No storm petrels were recorded during the 12 months of baseline bird surveys.
- 9.106 The flight height of storm petrels was not assessed in the report on flight heights by Johnston *et al.* 2014. However, storm petrels typically fly very close to the sea surface and are predicted to be at very low risk of any collision mortality.
- 9.107 It is not known if offshore wind farms displace storm petrels. However, they are a highly pelagic species and forage over a wide area. The possible displacement from the two turbines will not affect breeding storm petrels.
- 9.108 It is not known if there is a barrier effect on storm petrels from offshore wind farms. However, if a barrier effect does occur the additional distance required to fly around the 250 m platform base and two turbines will be negligible.
- 9.109 Storm petrels are not thought to be sensitive to disturbance (Furness & Wade 2012). However, should there be any disturbance to storm petrels they will be able to relocate elsewhere in suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels.

9.110 No storm petrels were recorded during the baseline surveys and no impacts are predicted to occur to storm petrel during the breeding period. Consequently, there will be no in-combination effects.

9.111 The potential impacts on storm petrel from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Leach's petrel (*Oceanodroma leucorhoa*)**

9.112 During the breeding season the storm petrel is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 119 km (Thaxter *et al* 2012).

- Sule Skerry and Sule Stack,
- North Rona and Sula Sgeir.

9.113 No Leach's petrels were recorded during the 12 months of surveys.

9.114 Johnston *et al.* (2014) did not assess the flight height of Leach's petrels in the report on flight heights and marine birds. However, Leach's petrels typically fly close to the sea surface and are predicted to be at very low risk of any collision mortality.

9.115 It is not known if offshore wind farms displace Leach's petrels. However, they are highly pelagic species and forage over a wide area. The possible displacement from the two turbines will not affect breeding Leach's petrels.

9.116 It is not known if there is a barrier effect on Leach's petrels from offshore wind farms. However, if a barrier effect does occur the additional distance required to fly around the 250 m platform base and two turbines will be negligible.

9.117 Leach's petrels are not thought to be sensitive to disturbance (Furness & Wade 2012). However, should there be any disturbance to Leach's petrels they will be able to relocate elsewhere in suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels.

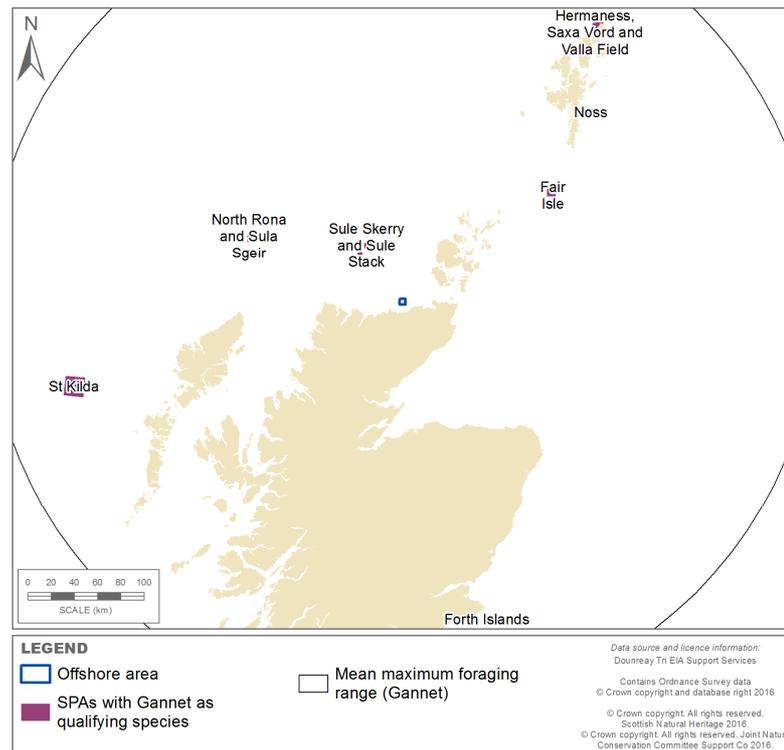
9.118 No Leach's petrels were recorded during the baseline surveys and no impacts are predicted to occur to them during the breeding period. Consequently, there will be no in-combination effects.

9.119 The potential impacts on Leach's petrel from the proposed Dounreay Tri demonstrator project, alone and in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Gannet (*Morus Bassanus*)**

9.120 During the breeding season the gannet is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 345 km (Thaxter *et al* 2012) (Figure 9-4):

- |                               |                                                         |
|-------------------------------|---------------------------------------------------------|
| • Sule Skerry and Sule Stack, | • Forth Islands,                                        |
| • North Rona and Sula Sgeir,  | • Hermaness, Saxa Vord and Valla Field,                 |
| • Fair Isle,                  |                                                         |
| • Noss,                       | • Outer Firth of Forth and St Andrews Bay Complex dSPA. |
| • St Kilda,                   |                                                         |



**Figure 9-4: SPAs for which breeding gannet is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.121 Gannets were recorded regularly during the breeding season with peak numbers recorded during June and August; peak densities of 1.88 birds/km<sup>2</sup> were recorded in the study area during August, which equates to a total of 146 birds. Within the project site there was a peak estimated abundance of 11 birds in August.
- 9.122 Results from site specific monitoring indicate that 30% of all flights were at turbine height (HiDef 2015). Consequently, there is a risk of a collision impact. This is a notably higher figure than has been published from other studies which indicate 12.6% of gannets fly at collision risk heights (Johnston *et al* 2014). Studies undertaken at constructed offshore wind farms have shown a very high level of macro-avoidance reducing the risk of potential collision mortality (Webb *et al.* 2015, APEM 2014).
- 9.123 Collision risk modelling undertaken using the Band Option 1 model and an avoidance rate of 98.9% indicate that there will be no collisions during the breeding or non-breeding seasons (Table 6-1).
- 9.124 It is concluded that although possible that collisions with the two turbines cannot be ruled out, the relatively low numbers of gannet recorded in the study area and the low risk of any collisions occurring indicate that very few, if any, gannets will collide with the proposed development. The potential impacts on the qualifying SPAs will be negligible.
- 9.125 If displacement does occur around the two turbines birds will be able to relocate elsewhere and the proportion of area from which they may be displaced is negligible compared to their overall foraging range of 345 km.
- 9.126 Should a barrier effect occur, the effect on a species of bird that forages over an extensive area would be negligible.

- 9.127 Gannets are not thought to be sensitive to disturbance from boats. Should there be any disturbance to gannet they will be able to relocate elsewhere in suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.
- 9.128 During the non-breeding period gannet densities were very low with densities of 0.19 km<sup>2</sup> or below. Based on a peak density, less than one gannet is estimated to occur within 1 km of the proposed development during the non-breeding period. The North Sea BDMP population during the autumn migration is 456,298 individuals and 248,385 individuals during the spring. The potential impact from the proposed development will not cause a likely significant or adverse effect.
- 9.129 The extensive foraging range of gannets indicates that there is potential for interactions with many offshore wind farms across Scottish waters. However, collision risk modelling indicates that there will be no collision mortality with the proposed project and very little displacement or barrier effects. Consequently, no impacts are predicted to occur that could cause an in-combination likely significant effect.
- 9.130 The potential impacts on gannet from the proposed Dounreay Tri demonstrator project, alone or in-combination will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Shag (*Phalacrocorax aristotelis*)**

- 9.131 The shag is a qualifying species for the North Orkney pSPA and Scapa Flow pSPA for the non-breeding period.
- 9.132 No shags were recorded during the baseline surveys. The North Orkney pSPA lies c. 51 km from proposed development and Scapa Flow c. 30 km. There will be no disturbance or displacement of shags within the pSPAs.
- 9.133 No impacts are predicted to occur to shags during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.134 The potential impacts on shags from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

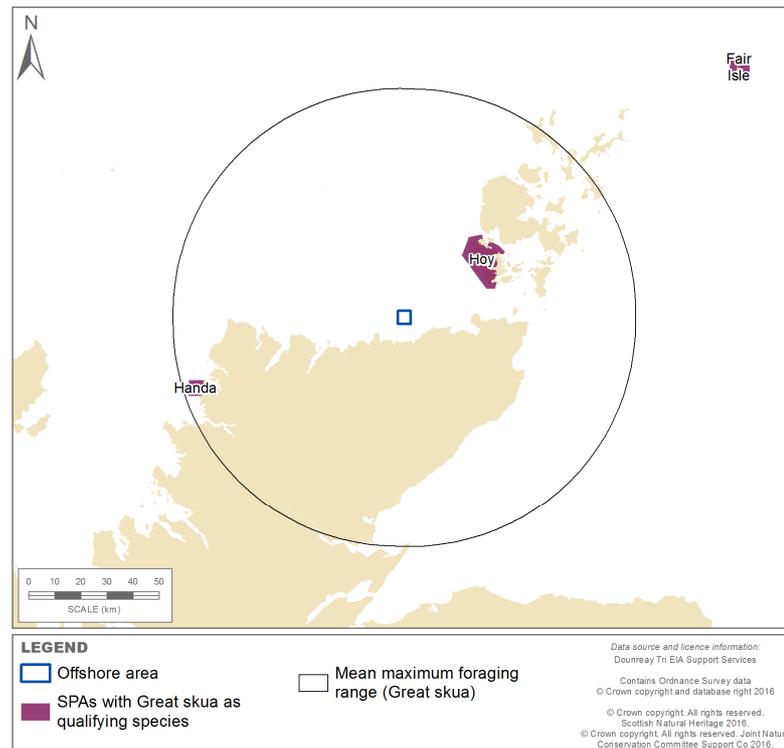
**Arctic skua (*Stercorarius parasiticus*)**

- 9.135 The Arctic skua is a qualifying species for the Pentland firth dSPA for the breeding period.
- 9.136 No Arctic skuas were recorded during the baseline surveys. The Pentland Firth dSPA lies c. 30 km from proposed development. There is predicted to be very low, if any, risk of collision disturbance or displacement on Arctic skuas from the dSPA.
- 9.137 No impacts are predicted to occur to Arctic skua during the breeding period. Consequently, there will be no in-combination effects.
- 9.138 The potential impacts on Arctic skuas from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Great skua (*Catharacta skua*)**

9.139 During the breeding season the great skua is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 86 km (Thaxter *et al* 2012) (Figure 9-5):

- Hoy,
- Handa.



**Figure 9-5: SPAs for which breeding great skua is a qualifying species and mean maximum (+1 s.d.) foraging range.**

9.140 Great skua were recorded in low numbers with 8 birds recorded during the four surveys surveys undertaken in May, June and August; peak densities of 0.14 birds/km<sup>2</sup> were recorded during June in the wider study area and 0.28 birds/km<sup>2</sup> in the project site. This equates to a peak estimate of 11 birds.

9.141 Great skuas are at low risk of collision with Johnston *et al.* (2014) indicating that over 94% of great skua fly below collision risk height. Collision risk modelling using generic flight height data indicate that there will be no collisions and the risk of any great skuas colliding with the two turbines is predicted to be extremely low (Table 6-1).

9.142 It is not known whether great skuas will be displaced by the proposed development. The review undertaken by Langston (2010) suggested that great skuas are at low risk of displacement effects. The species is highly mobile and pelagic in nature and therefore will be able to relocate elsewhere should displacement effects occur.

9.143 The nearest great skua breeding colony is on Hoy, 28 km away. The species migrates to waters off southern Europe and West Africa. If barrier effects should occur the increased flight distance required to avoid the two turbines is negligible compared to the flight flown from the nearest colony or compared to the distances flown during migration.

- 9.144 Great skuas are not considered susceptible to disturbance impacts and was considered one the least sensitive species from disturbance by Furness & Wade (2012). Consequently, disturbance arising from vessels during construction, operation or decommissioning is not likely to cause an effect.
- 9.145 No great skuas were recorded during the non-breeding period and therefore no impact on the non-breeding population is predicted to occur.
- 9.146 There are no offshore wind farms within the mean maximum foraging ranges of great skua during the breeding period that could cause an in-combination impact. Other offshore activities could cause disturbance. However, great skuas are not sensitive to disturbance and no in-combination impacts are predicted to occur.
- 9.147 The potential impacts on great skua from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Slavonian grebe (*Podiceps auritus*)**

- 9.148 The Slavonian grebe is a qualifying species for the Pentland Firth and Scapa Flow dSPA and North Orkney dSPA for the non-breeding period.
- 9.149 No Slavonian grebes were recorded during the baseline surveys. The Pentland Firth and Scapa Flow dSPA lies c. 30 km from proposed development and the North Orkney dSPA lies c. 51 km away. There will be no disturbance or displacement of Slavonian grebes within the dSPA.
- 9.150 No impacts are predicted to occur to Slavonian grebes during the non-breeding period. Consequently, there will be no in-combination effects.
- 9.151 The potential impacts on Slavonian grebe from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Hen harrier (*Circus cyaneus*)**

- 9.152 The hen harrier is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.153 No hen harriers were recorded during the baseline surveys during the breeding season. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.154 The site is unsuitable for breeding hen harriers and although they could forage in the onshore area, disturbed birds will be able to forage elsewhere in more suitable habitats.
- 9.155 No impacts are predicted to occur to hen harriers during breeding period. Consequently, there will be no in-combination effects.
- 9.156 The proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Golden eagle (*Aquila chrysaetos*)**

- 9.157 The golden eagle is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.

- 9.158 No golden eagles were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 4 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.159 No impacts are predicted to occur to golden eagles during breeding period. Consequently, there will be no in-combination effects.
- 9.160 The site is unsuitable for golden eagle and the proposed Dounreay Tri demonstrator project, alone or in-combination will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Golden plover (*Pluvialis apricaria*)**

- 9.161 The golden plover is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.162 No golden plover were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.163 Golden Plovers breed on heather moorland, blanket bog, acidic grasslands and montane summits, where they prefer to nest on high, flat or gently sloping plateaux, away from the moorland edge. Adjacent pastures with abundant earthworms and tipulid larvae are important for feeding adults and chicks may be moved up to 2 km or more to feed in marshy areas rich in invertebrate food (Stroud *et al.* 2001). Although the core feeding range may be 3 km and up to a maximum of 11 km (SNH 2013b).
- 9.164 Adult golden plover use fields for feeding prior to dispersal onto the nesting areas. Their use of fields continues once eggs have been laid, with birds spending half their time feeding in fields when not incubating (SNH 2013b). The fields are not used once the chicks have hatched.
- 9.165 There is no evidence that the site is used regularly by breeding golden plover but should it be, then it is predicted that they will be able to relocate elsewhere during the construction and decommissioning periods. During the period of operation there will be very little disturbance at the site.
- 9.166 It is concluded that there is a very low risk of any breeding golden plover occurring in the area and potentially being disturbed by the onshore cable route and new substation.
- 9.167 No impacts are predicted to occur to breeding golden plover during breeding period. Consequently, there will be no in-combination effects.
- 9.168 The potential impacts on golden plover from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Dunlin (*Calidris alpina*)**

- 9.169 The dunlin is a qualifying species for the Caithness and Sutherland Peatlands SPA and Ramsar for breeding season.
- 9.170 No dunlin were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.171 Their core foraging area for dunlin is up to 500 m from the nest, with a maximum range of 3 km (SNH 2013b). Dunlin breed alongside golden plover in areas of poorly drained peat soils.

They will also feed with golden plover in areas of pasture but do not travel as far from their breeding sites, remaining largely within 500 m of the nest. (SNH 1996).

- 9.172 The distance the onshore cable route and new substation are from the site boundary indicate that the site will not be used by breeding dunlin and the risk of any dunlin occurring is very low.
- 9.173 No impacts are predicted to occur to dunlin during breeding period. Consequently, there will be no in-combination effects.
- 9.174 The potential impacts on dunlin from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Greenshank (*Tringa nebularia*)**

- 9.175 The greenshank is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.176 No greenshank were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.177 Their core foraging area is up to 2 km from the nest, with a maximum range of 3 km (SNH 2013b). Greenshank breed in areas of poorly drained peat soils. Their preferred breeding habitat comprise of heather and moss blanket mires with lowland dry acid grassland being less favoured and then only for feeding in areas near streams and rivers (SNH 1996).
- 9.178 Consequently, the distance the onshore cable route and new substation are from the site boundary and the unsuitability of the habitat for breeding greenshank mean the risk of any greenshank occurring is very low.
- 9.179 No impacts are predicted to occur to greenshank during breeding period. Consequently, there will be no in-combination effects.
- 9.180 The potential impacts on greenshank from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

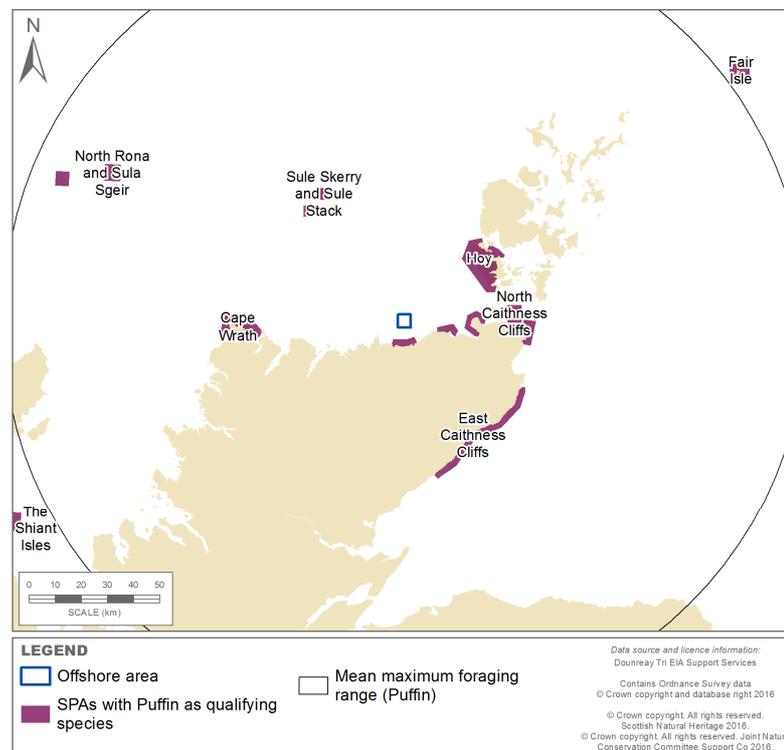
**Wood sandpiper (*Tringa glareola*)**

- 9.181 The wood sandpiper is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.182 No wood sandpipers were recorded during the baseline surveys. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.
- 9.183 Wood sandpiper nest in areas of boggy moorland with scattered pools, and marsh and do not occur on areas of pasture (Stroud *et al.* 2001). The habitat is not suitable for breeding wood sandpipers and the risk of any wood sandpipers occurring is negligible.
- 9.184 No impacts are predicted to occur to wood sandpipers during breeding period. Consequently, there will be no in-combination effects.
- 9.185 The potential impacts on wood sandpiper from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Puffin (*Fratercula arctica*)**

9.186 During the breeding season the puffin is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 151 km (Thaxter *et al.* 2012) (Figure 9-6):

- North Caithness Cliffs,
- Hoy,
- East Caithness Cliffs,
- Sule Skerry and Sule Stack,
- Cape Wrath,
- West Westray,
- North Rona and Sula Sgeir.



**Figure 9-6: SPAs for which puffin is a qualifying species and mean maximum (+1 s.d.) foraging range.**

9.187 Puffins occurred regularly within the survey area between April and October with peak numbers in June. Peak densities occurred during one of the two surveys undertaken in June, when with 59.28 birds/km<sup>2</sup> were recorded over the wider study area, equating to a peak population estimate of 4,601 birds. The density of puffins within the project site during June was similar to that of the wider study area at 60.14 birds/km<sup>2</sup>, giving an estimated peak puffin population of 1,505 birds within the 25 km<sup>2</sup> project site. A second survey undertaken in June recorded significantly lower estimated densities of 0.51 birds/km<sup>2</sup>.

9.188 Puffins are at very low risk of collision with 99.9% of puffins predicted to fly below rotor height (Cook *et al.* 2012, Johnston *et al.* 2014). Consequently, there is a very low risk of any collisions.

9.189 The area of potential displacement is, for the purposes of this assessment, predicted to be within 1 km of the proposed development. Therefore, the maximum number of puffins predicted to be within 1 km of the proposed development and at risk of displacement is 188

individuals. The level of potential displacement, if any, of puffins from offshore wind turbines is unknown. Studies undertaken for consented offshore wind farms have been based on a displacement level of 60% (Searle *et al.* 2014). The potential displacement of 60% of puffins within a 1 km radius of the proposed development would cause an estimated total of 113 puffins to be displaced, based on a peak density of 60.14 birds/km<sup>2</sup>.

9.190 It is not thought that the possible displacement of puffins from two turbines will cause any level of mortality. However, following advice received (SNH 2016c), Table 9-1 presents the range of possible displacement and mortality for puffins based on peak numbers recorded.

**Table 9-1: Estimated number of puffins predicted to be at risk of mortality following displacement from within 1 km the offshore site during the breeding period.**

Displacement level (%)	Mortality (%)												
	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
10%	0	1	2	4	6	8	9	11	13	15	17	19	
20%	1	2	4	8	11	15	19	23	26	30	34	38	
30%	1	3	6	11	17	23	28	34	39	45	51	56	
40%	2	4	8	15	23	30	38	45	53	60	68	75	
50%	2	5	9	19	28	38	47	56	66	75	85	94	
60%	2	6	11	23	34	45	56	68	79	90	102	113	
70%	3	7	13	26	39	53	66	79	92	105	118	132	
80%	3	8	15	30	45	60	75	90	105	120	135	150	
90%	3	8	17	34	51	68	85	102	118	135	152	169	
100%	4	9	19	38	56	75	94	113	132	150	169	188	

9.191 Should a barrier effect occur, the effect on a species of bird that forages over a wide area would be negligible.

9.192 Puffins are not thought to be sensitive to disturbance from boats (Furness & Wade 2012). Should there be any disturbance puffins will be able to relocate elsewhere to suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.

9.193 During the non-breeding period a total of six puffins were recorded with four in September and two in October. The non-breeding North Sea BDMP population is 231,957 individuals and 85.4% of all British breeding puffins occur in SPAs (Furness 2015). Any possible impact on the very low numbers of puffin recorded would not cause a likely significant effect on any of the relevant SPA puffin populations.

9.194 The potential impacts from collision mortality, barrier effects or disturbance on puffin from the proposed Dounreay Tri demonstrator project will not affect the conservation status of the species, nor the conservation objectives of the sites. However, there is uncertainty over the effect displacement impacts may have on puffins at colonies for which they are a qualifying species. Consequently, the potential impact from displacement on puffin is considered further.

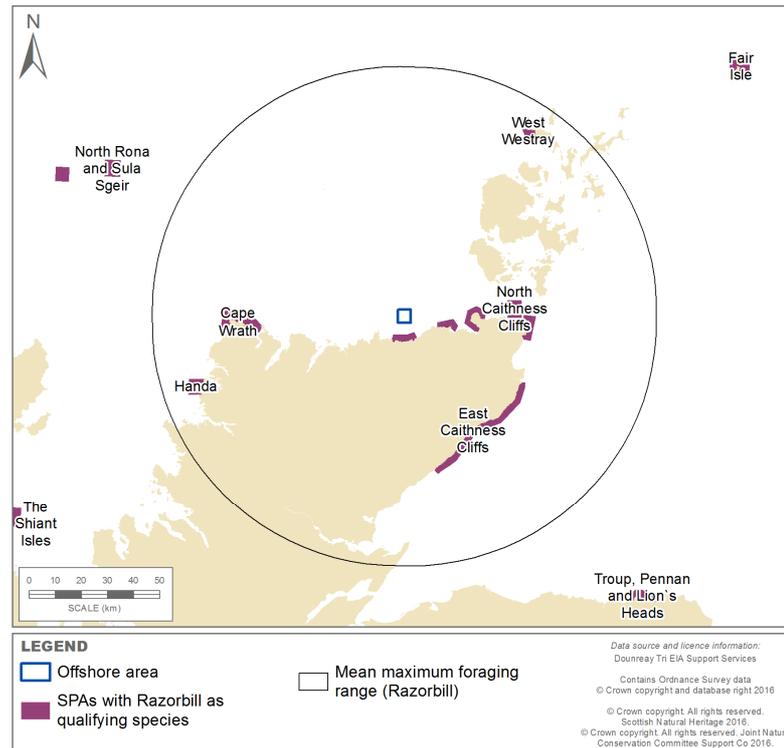
9.195 In order to determine the potential impacts from displacement on puffins from the relevant SPAs, the numbers of birds displaced have been apportioned across the breeding colonies following SNH guidance (SNH 2014). The breeding population at each SPA and the distance each SPA is from the proposed development are presented in Table 7-7. The results indicate that of the 113 puffins predicted to be displaced within 1 km of the proposed development, 107 will be from the North Caithness Cliffs SPA and six will be from Sule Skerry and Sule Stack SPA.

- 9.196 During the breeding period the proportion of immature birds present within the population attending the colony varies with few immature birds present during April but with increasing numbers during May and June. An estimated 30% of the population present during this period are immature birds (Wanless *et al.* 1998). Consequently, not all displaced birds are breeding adults from an SPA and of the 107 birds predicted to be displaced from the North Caithness Cliffs, 64 will be breeding adults. Similarly, four adult breeding puffins from the Sule Skerry and Sule Stack SPA will be displaced.
- 9.197 Modelling undertaken to assess potential effects from displacement of puffins at other offshore wind farms indicates that prey distribution may have the greatest effect on the adult survival of displaced puffins, particularly if the prey is homogenously distributed (Searle *et al.* 2014). Puffins forage primarily on sandeels, a shoaling species of fish with very specific spawning habitat requirements and do not have a homogenous distribution.
- 9.198 Displaced birds will be able to relocate and the area of potential habitat lost to foraging will be relatively small compared to the overall foraging range for this species. If birds are displaced from an area of 1 km from the proposed development, then approximately 3.5 km<sup>2</sup> of sea might be lost to foraging. The mean maximum foraging range of puffin is 151 km; an area of 71,631 km<sup>2</sup>. Although over half this potential foraging area comprises land, e.g. mainland Scotland and the Orkney Islands (Figure 9-6), a significant area of sea remains suitable for foraging.
- 9.199 The assessment is based on one peak count obtained in June. A subsequent survey in June and all other surveys recorded relatively low densities of puffins with the next highest density of 1.91 birds/km<sup>2</sup> in May and 0.51 birds/km<sup>2</sup> in the second June survey. The peak count of 60.14 birds/km<sup>2</sup> appears to be exceptional.
- 9.200 The potential displacement of up to 64 adult breeding puffins from a breeding population of 7,045 breeding pairs at the North Caithness Cliffs SPA will not cause a likely significant or adverse effect.
- 9.201 The potential displacement of four adult breeding puffins from a breeding population of 59,471 breeding pairs at Sule Skerry and Sule Stack SPA will not cause a likely significant or adverse effect.
- 9.202 There is potential for in-combination impacts with other offshore activities including the:
- The Orkney-Caithness interconnector cable (*Orkney - Caithness 220 kV Link*),
  - Brims Tidal Array,
  - MeyGen,
  - Beatrice Offshore Wind Farm,
  - Moray Firth Offshore Wind Farm,
  - Fall of Warness test centre
- 9.203 Potential in-combination effects include displacement, barrier and disturbance during construction, operation and decommissioning phases of the developments.
- 9.204 No impacts are predicted to arise from the proposed development on puffins at SPA colonies other than the North Caithness Cliffs and Sule Skerry and Sule Stack SPAs.
- 9.205 Displacement impacts from the: Orkney-Caithness 220 kV Link, Brims Tidal Array and the MeyGen projects are predicted to be temporary and localised during construction, operation and decommissioning. Although there is an unknown level of collision risk with subsea turbines. However, due to the localised area of impact, predicted low level of effect and temporary nature of any impacts, it is predicted that there will be no in-combination impacts likely to cause a significant or adverse effect from these developments.

- 9.206 There is potential for 0.5 puffins per year to be impacted by the Falls of Warness test centre at the North Caithness Cliffs, East Caithness Cliffs and Hoy.
- 9.207 There is potential for in-combination displacement impacts from Beatrice and Moray offshore wind farms, located in the Moray Firth. Population modelling undertaken for the Moray Firth offshore wind farm indicated that the North Caithness Cliffs SPA adult puffin population could sustain an increase in adult mortality of between 205 and 341 individuals per year (Marine Scotland 2014). The current in-combination level impact on adult puffins from existing offshore wind farms was estimated to be 137 individuals.
- 9.208 Should all 64 adult puffins predicted to be displaced by the Dounreay Tri demonstrator project development not survive then an in-combination effect of 201 adult breeding puffins could occur. This is marginally below the lower level identified as causing a population level effect. However, this is also highly precautionary, as not all displaced puffins will cause an increase in adult mortality. The modelling undertaken to support the wind farm assessments within the Moray Firth indicates that the displacement of 64 puffins could cause an additional 18 breeding adult mortalities per year. This is approximately equivalent to a mortality of 17% from displacement effects (Table 9-1).
- 9.209 The potential mortality of 18 puffins in-combination with other offshore wind farms will be below a level predicted to cause a population level effect.
- 9.210 Although the modelling has been undertaken for two other wind farms predicted to have a significantly greater displacement effect than the proposed development and alternative methods have been developed to assess impacts on puffins for the wind farms in the Firth of Forth. The results provide an indication of the potential impact displacement of puffins from the proposed development could have. However, it also recognised that the level of displacement is based on a single peak density, considerably higher than all other counts undertaken at the site during the breeding period. Consequently, this level of displacement is not predicted to occur throughout the breeding period and possible impacts will be significantly lower. Even based on the results from a very high peak density, modelling suggests that the in-combination impact will be below that at which a population level effect will occur.
- 9.211 The potential impacts on puffin from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant or adverse effect on site integrity.

**Razorbill (*Alca torda*)**

- 9.212 During the breeding season the razorbill is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 83 km (Thaxter *et al* 2012) (Figure 9-7):
- North Caithness Cliffs,
  - East Caithness Cliffs,
  - West Westray,
  - Cape Wrath,
  - Handa.



**Figure 9-7: SPAs for which breeding razorbill is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.213 Razorbill occurred regularly in low numbers within the survey area throughout the year. Peak numbers occurred in the second survey undertaken in June, when a peak density of 1.37 birds/km<sup>2</sup> was recorded, equating to an estimated population size of 49 birds within the project site and four birds within 1 km<sup>2</sup>.
- 9.214 Razorbills are at very low risk of collision with 2.7% of razorbills predicted to fly at collision risk height (Johnston *et al.* 2014). Consequently, there is a very low risk of any collisions by razorbill.
- 9.215 Evidence from existing offshore wind farms indicate that razorbills may be displaced by offshore wind farms. Studies undertaken for consented offshore wind farms have been based on a displacement level of 60% (Searle *et al.* 2014) and this level of displacement is supported by some empirical data. However, evidence of displacement has not been found at all wind farms (Furness 2016). The potential displacement of 60% of razorbills within a 1 km radius of the proposed development would cause an estimated total of two razorbills to be displaced, based on a peak density of 1.37 birds/km<sup>2</sup> (Table 9-2). Displaced bird will be able to relocate elsewhere and the effect will be negligible.

**Table 9-2: Estimated number of razorbills predicted to be at risk of mortality following displacement from within 1 km the offshore site during the breeding period.**

Displacement level (%)	Mortality (%)												
	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
10%	0	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	1	1	1	1
30%	0	0	0	0	0	0	0	1	1	1	1	1	1
40%	0	0	0	0	0	0	1	1	1	1	1	1	2
50%	0	0	0	0	1	1	1	1	1	2	2	2	2
60%	0	0	0	0	1	1	1	1	2	2	2	2	2
70%	0	0	0	1	1	1	1	2	2	2	3	3	3
80%	0	0	0	1	1	1	2	2	2	3	3	3	3
90%	0	0	0	1	1	1	2	2	3	3	3	4	4
100%	0	0	0	1	1	2	2	2	3	3	4	4	4

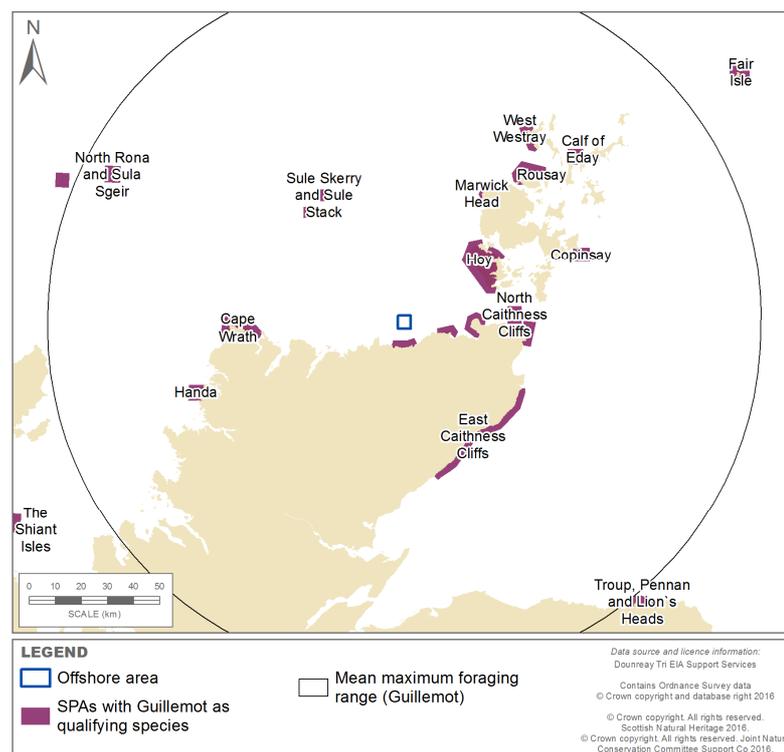
- 9.216 Should a barrier effect occur, the effect on a species of bird that forages over a wide area, up to 83 km from the colony would be negligible.
- 9.217 Razorbills are thought to be moderately sensitive to disturbance from boats (Furness & Wade 2012). Should there be any disturbance, razorbills will be able to relocate elsewhere to suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.
- 9.218 During the non-breeding period a total of 30 razorbills were recorded with a peak density in December of 0.39/km<sup>2</sup>. Consequently, no more than one razorbill is predicted to occur within 1 km of the proposed development during the non-breeding period. The BDMP population of razorbills during the non-breeding period is 218,622 individuals and increases during migration to 591,874 individuals (Furness 2015). A total of 92.9% of the British breeding population occurs within SPAs. The potential displacement of up to one bird during the non-breeding period will not have a likely significant effect the relevant SPA populations.
- 9.219 Potential in-combination impacts could occur from the projects identified in Section 6.
- 9.220 Displacement impacts from the: Orkney-Caithness 220 kV Link, Brims Tidal Array and the MeyGen projects are predicted to be temporary and localised during construction, operation and decommissioning. Although there is an unknown level of collision risk with subsea turbines. However, due to the localised area of impact, predicted low level of effect and temporary nature of any impacts, it is predicted that there will be no in-combination impacts likely to cause a significant or adverse effect from these developments.
- 9.221 The Fall of Warness development is predicted to cause the death of 0.1 razorbills per year from the North Caithness Cliffs SPA (MS-LOT 2015).
- 9.222 There is potential for an in-combination impact with the Beatrice and Moray Firth offshore wind farms that are located within the mean maximum (+1 s.d.) foraging range of this species.
- 9.223 Population modelling undertaken to support the wind farms within the Moray Firth indicates that the North Caithness Cliffs razorbill population could sustain the additional loss of between 15 to 46 breeding adults per year. The in-combination impact of the two wind farms indicated a displacement of 22 birds and concluded no adverse effect (Marine Scotland 2014). If all two razorbills predicted to be displaced by the proposed development are breeding adults originating from the SPA then the number of birds displaced will be very small compared to the breeding population of 1,700 breeding pairs and within the range of the population modelling and therefore not predicted to cause an adverse effect.

9.224 The potential impacts on razorbill from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant or adverse effect on site integrity.

**Guillemot (*Uria aalge*)**

9.225 During the breeding season the guillemot is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 134 km (Thaxter *et al* 2012) (Figure 9-8).

- North Caithness Cliffs,
- Hoy,
- East Caithness Cliffs,
- Sule Skerry and Sule Stack,
- Cape Wrath,
- Marwick Head,
- Rousay,
- Copinsay,
- Handa,
- West Westray,
- Calf of Eday,
- North Rona and Sula Sgeir,
- Troup, Pennan and Lion's Heads,
- Pentland Firth and Scapa Flow (dSPA).



**Figure 9-8: SPAs for which breeding guillemot is a qualifying species and mean maximum (+1 s.d.) foraging range.**

9.226 Guillemot occurred regularly within the survey area throughout the year and were the most abundant species recorded. Relatively high densities occurred during May and June and again in November and December. A peak density of 13.7 birds/km<sup>2</sup> was recorded in June. This equates to a total of 1,063 guillemots across the wider study area. Similar densities were recorded within the project site with a peak density of 13.16 birds/km<sup>2</sup>, equating to a

population estimate of 323 birds. An estimated maximum of 43 guillemots may be displaced from within 1 km radius of the wind farm.

9.227 Guillemots are at very low risk of collision with 99.6% of guillemots predicted to fly below collision risk height (Johnston *et al.* 2014). Consequently, there is a very low risk of any collisions by guillemot.

9.228 Evidence from existing offshore wind farms indicate that offshore wind farms may displace guillemots. Studies undertaken for consented offshore wind farms have been based on a displacement level of 60% (Searle *et al.* 2014). This level of displacement is generally supported by most of the studies undertaken at existing wind farms that have shown partial displacement (Furness 2016). The potential displacement of 60% of guillemots within a 1 km radius of the proposed development would cause an estimated total of 26 guillemots to be displaced, based on a peak density of 13.7 birds/km<sup>2</sup>.

9.229 Table 9-3 presents the range of guillemots that could be impacted depending on the level of displacement and, should it occur, mortality.

**Table 9-3: Estimated number of guillemots predicted to be at risk of mortality following displacement from within 1 km of the offshore site during the breeding period.**

		Mortality (%)											
		2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Displacement level (%)	10%	0	0	0	1	1	2	2	3	3	3	4	4
	20%	0	0	1	2	3	3	4	5	6	7	8	9
	30%	0	1	1	3	4	5	6	8	9	10	12	13
	40%	0	1	2	3	5	7	9	10	12	14	15	17
	50%	0	1	2	4	6	9	11	13	15	17	19	22
	60%	1	1	3	5	8	10	13	15	18	21	23	26
	70%	1	2	3	6	9	12	15	18	21	24	27	30
	80%	1	2	3	7	10	14	17	21	24	28	31	34
	90%	1	2	4	8	12	15	19	23	27	31	35	39
	100%	1	2	4	9	13	17	22	26	30	34	39	43

9.230 The closest SPA colony to the proposed development is the North Caithness Cliffs SPA that has a breeding population of 47,000 guillemots.

9.231 Following SNH guidance on apportioning impacts on breeding seabirds across SPAs (SNH 2014) it is predicted that all 26 displaced guillemots will originate from the North Caithness Cliffs SPA and there will be no displacement effects at other breeding colonies.

9.232 If all the estimated 26 displaced guillemots are from the one SPA then approximately 0.05% of the population might be affected. Displaced birds will be able to relocate elsewhere and the effect on 0.05% of the population will be negligible.

9.233 Should a barrier effect occur, the effect on a species of bird that forages over a wide area, up to 134 km from the colony, would be negligible.

9.234 Guillemots are thought to be moderately sensitive to disturbance from boats (Furness & Wade 2012). Should there be any disturbance, guillemots will be able to relocate elsewhere to suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.

9.235 Potential in-combination impacts could occur from the projects identified in Section 6.

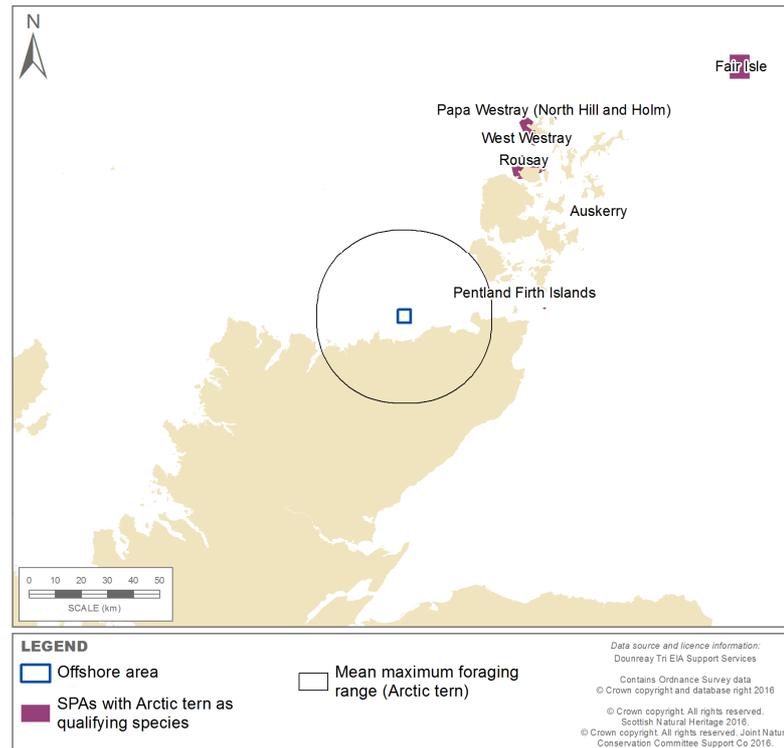
9.236 Displacement impacts from the: Orkney-Caithness 220 kV Link, Brims Tidal Array and the MeyGen projects are predicted to be temporary and localised during construction, operation and decommissioning. Although there is an unknown level of collision risk with subsea

turbines. However, due to the localised area of impact, predicted low level of effect and temporary nature of any impacts, it is predicted that there will be no in-combination impacts likely to cause a significant or adverse effect from these developments.

- 9.237 There is predicted to be a total of 6.9 mortalities per year from the Fall of Warness development across the North Caithness cliffs, East Caithness Cliffs SPA, Hoy SPA, Copinsay and Marwick Head. The in-combination assessment concluded no adverse effect (MS-LOT 2015).
- 9.238 There is potential for an in-combination impact with the Beatrice and Moray Firth offshore wind farms that are located within the mean maximum (+1 s.d.) foraging range of this species.
- 9.239 Population modelling undertaken to support the wind farms within the Moray Firth indicates that the North Caithness Cliffs razorbill population could sustain the additional loss of between 248 and 745 breeding adults per year. The in-combination impact of the two wind farms indicated a displacement of 322 birds and concluded no adverse effect (Marine Scotland 2014).
- 9.240 It is recognised that the modelling was undertaken to support larger offshore wind farm projects and may not be directly comparable. However, the results provide an indication of the level of impact displacement effects may have on the guillemots from the North Caithness Cliffs SPA. The potential displacement of 26 birds from the proposed Dounreay Tri demonstrator project is relatively small proportion of the potential in-combination affects.
- 9.241 The potential impacts on guillemot from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant or adverse effects on site integrity.

#### **Arctic tern (*Sterna paradisaea*)**

- 9.242 During the breeding season the Arctic tern is a qualifying species for one dSPA within its mean maximum foraging range (+1 s.d.) of 31 km (Thaxter *et al* 2012).
- Pentland Firth and Scapa Flow dSPA.
- 9.243 The Pentland Firth Islands are an SPA for breeding Arctic tern and lie within the Pentland Firth and Scapa Flow dSPA but are beyond the mean maximum foraging range of breeding Arctic terns (Figure 9-9).



**Figure 9-9: SPAs for which breeding Arctic tern is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.244 Arctic tern occurred in June, July and October. The numbers recorded were very similar in June and July with 39 birds in June and 38 in July. Peak densities of 1.77 birds in the wider study area, equating to 129 birds were recorded in July and 1.33 birds/km<sup>2</sup>, equating to 33 birds in the study area during the same period. Based on peak densities approximately 6 Arctic terns could be displaced within 1 km of the turbines.
- 9.245 Arctic terns are at very low risk of collision with site-specific data recording 93% of Arctic terns as flying below rotor height. This is similar to the 96% predicted to fly below collision risk height by Johnston *et al.* (2014). Collision risk modelling predicts one collision per year, during the breeding season, with the proposed development (Table 6-1).
- 9.246 The nearest SPA breeding colony is the Pentland Firth Islands SPA is outwith the mean maximum foraging (+1 s.d.) range of Arctic terns and therefore birds at risk of collision during the breeding season are not predicted to come from an SPA breeding colony.
- 9.247 The Pentland Firth dSPA has a breeding population of 1,000 breeding pairs (SNH 2016b). Birds from this SPA could occur in the area of the proposed development. However, the collision risk modelling indicates a very low risk of collisions occurring, with only one per year predicted, and therefore no significant effect is predicted to occur from collision impacts.
- 9.248 Evidence from existing offshore wind farms indicate that Terns (common/Arctic) are not displaced by offshore wind farms. No displacement of Terns was recorded following three years of post-construction monitoring at Egmond aan Zee offshore wind farm in the Netherlands (Lindeboom *et al.* 2011), nor was any displacement recorded following extensive post-construction monitoring at Arklow Bank in Ireland (Barton *et al.* 2010) or at German offshore wind farms (Diersche and Garthe 2006). Although not predicted, should a level of displacement occur then birds would be able to relocate elsewhere and the loss of less than 4 km<sup>2</sup> of possible foraging area is not predicted to cause a significant effect.

9.249 Table 9-4 presents a range of potential levels of displacement and mortality for Arctic tern. In the unlikely event that displacement of up to 40% of Arctic terns will occur between zero and two birds could be at risk should displacement cause mortality. No mortality is predicted to occur due to displacement effects and for even one bird to be impacted a mortality rate of 30% is required.

**Table 9-4: Estimated number of Arctic terns predicted to be at risk of mortality following displacement from within 1 km of the offshore site during the breeding period.**

Displacement level (%)	Mortality (%)												
	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
10%	0	0	0	0	0	0	0	0	0	0	1	1	
20%	0	0	0	0	0	0	1	1	1	1	1	1	
30%	0	0	0	0	1	1	1	1	1	1	2	2	
40%	0	0	0	0	1	1	1	1	2	2	2	2	
50%	0	0	0	1	1	1	2	2	2	2	3	3	
60%	0	0	0	1	1	1	2	2	3	3	3	4	
70%	0	0	0	1	1	2	2	3	3	3	4	4	
80%	0	0	0	1	1	2	2	3	3	4	4	5	
90%	0	0	1	1	2	2	3	3	4	4	5	5	
100%	0	0	1	1	2	2	3	4	4	5	5	6	

9.250 Should a barrier effect occur, the effect of detouring around the two turbines and 250 m platform on a species of bird that forages up to 31 km from the colony would be negligible.

9.251 Arctic terns are thought to have a relatively low sensitivity to disturbance from boats (Furness & Wade 2012). Should there be any disturbance, Arctic terns will be able to relocate elsewhere to suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.

9.252 During the non-breeding period a total of three Arctic terns were recorded in October. The North Sea BDMP population during migration is 163,930 individuals and therefore the very low numbers recorded within the proposed development is a very small proportion of the non-breeding population. No collision or displacement effects are predicted to occur and there will not be any likely significant or adverse effect on SPA populations during the non-breeding period.

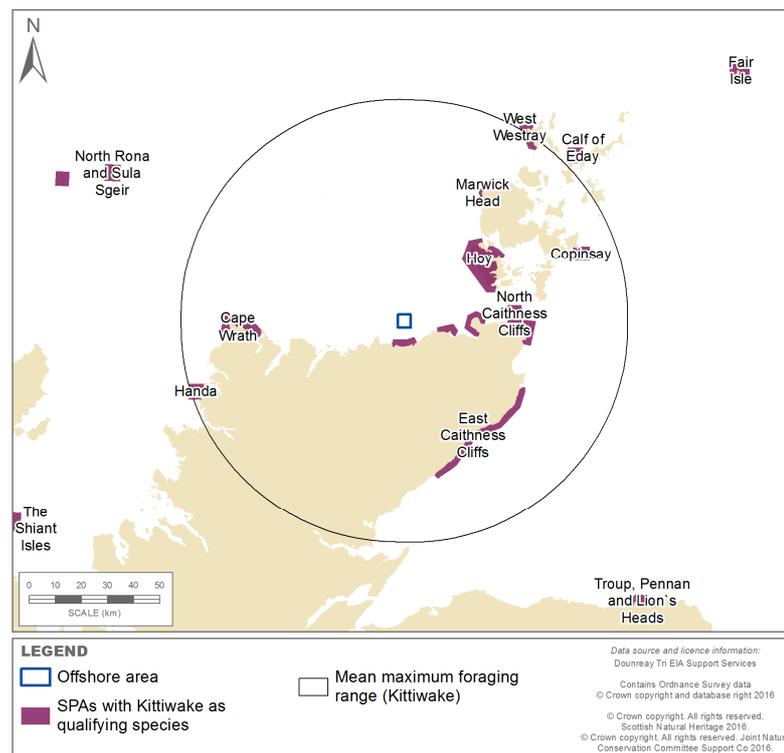
9.253 No impacts are predicted to occur to Arctic terns during the breeding period. Consequently, there will be no in-combination effects.

9.254 The potential impacts on Arctic tern from the proposed Dounreay Tri demonstrator project, alone or in-combination will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

***Kittiwake (Rissa Tridactyla)***

9.255 During the breeding season the kittiwake is a qualifying species for the following SPAs within its mean maximum foraging range (+1 s.d.) of 86 km (Thaxter *et al* 2012) (Figure 9-10):

- North Caithness Cliffs,
- Hoy,
- East Caithness Cliffs,
- Marwick Head,
- Copinsay,
- Handa,
- West Westray,
- Calf of Eday.



**Figure 9-10: SPAs for which breeding kittiwake is a qualifying species and mean maximum (+1 s.d.) foraging range.**

- 9.256 Kittiwakes were present in the survey area in all months at low to moderate density but increased in June with a peak of 6.04 birds/km<sup>2</sup> in the wider study area and 8.04 birds/km<sup>2</sup> within the project site. Based on the peak density of birds recorded up to 25 kittiwakes may occur within 1 km radius of the demonstrator project.
- 9.257 Kittiwakes are recognised to be at risk of collision mortality with 29% of all recorded site-specific flight heights at collision risk height. However, the sample size of the site-specific data of 121 birds is relatively low. The proportion of flight heights reported from other studies, suggests that between 15% and 16% of flight heights occur at collision risk height (Johnston *et al.* 2014, Furness *et al.* 2013).
- 9.258 Collision risk modelling undertaken for the proposed development using Band Option 1 model and a 98.9% avoidance rate, estimates nine (12 at 95% CI) kittiwakes per breeding season will collide with the turbines.
- 9.259 It is not known from which SPA, if any, kittiwakes at risk of collision with the proposed development originate from. A worst-case scenario would be that they all originate from a single SPA colony, which is likely to be the closest; in this case the North Caithness Cliffs SPA. The kittiwake breeding population is estimated to be 10,150 breeding pairs (Furness 2014). Although the breeding kittiwake population has declined since the site designation cited population of 13,100 breeding pairs (Sitelink 2016) and the population is in an 'unfavourable' condition the potential loss of up to nine kittiwakes out of a breeding population of 20,300 individuals is 0.04% of the population. This worst-case scenario is not predicted to cause a likely significant effect.

9.260 Studies from existing offshore wind farms indicate that there is a very low risk of any displacement of kittiwakes (Furness 2016).

9.261 Table 9-5 presents a range of potential levels of displacement and mortality for kittiwake. In the unlikely event that displacement of up to 40% of kittiwakes will occur then between zero and ten birds could be at risk should displacement cause mortality. No mortality is predicted to occur due to displacement effects and for even one bird to be impacted a mortality rate of 5% is required.

**Table 9-5: Estimated number of kittiwakes predicted to be at risk of mortality following displacement from within 1 km of the offshore site during the breeding period**

		Mortality (%)											
		2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Displacement level (%)	10%	0	0	0	1	1	1	1	2	2	2	2	3
	20%	0	0	1	1	2	2	3	3	4	4	5	5
	30%	0	0	1	2	2	3	4	5	5	6	7	8
	40%	0	1	1	2	3	4	5	6	7	8	9	10
	50%	0	1	1	3	4	5	6	8	9	10	11	13
	60%	0	1	2	3	5	6	8	9	11	12	14	15
	70%	0	1	2	4	5	7	9	11	12	14	16	18
	80%	0	1	2	4	6	8	10	12	14	16	18	20
	90%	0	1	2	5	7	9	11	14	16	18	20	23
	100%	1	1	3	5	8	10	13	15	18	20	23	25

9.262 Should displacement occur around the two turbines, birds will be able to relocate elsewhere and the proportion of area from which they may be displaced is negligible compared to their overall foraging range.

9.263 Should a barrier effect occur, the effect on a species of bird that forages over a wide area and up to 86 km from a colony, will be negligible.

9.264 Kittiwakes are not thought to be sensitive to disturbance from boats. Should there be any disturbance to kittiwake they will be able to relocate elsewhere in suitable habitat. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.

9.265 During the non-breeding period peak densities of kittiwakes of 4.64/km<sup>2</sup> occurred during November. Based on this peak density the maximum number of kittiwakes estimated to occur within 1 km of the proposed development is fifteen birds. The North Sea BDMP population during the autumn migration is 829,937 individuals. An estimated 55% of the British kittiwake population is from a SPA (Furness 2015).

9.266 Collision risk modelling estimates up to six kittiwakes may collide during the non-breeding season. Assuming that 55% of these are from a UK SPA, three birds may be from an SPA. If all three birds are from the North Caithness Cliff SPA then this would impact on 0.014% of the breeding population.

9.267 Combined collision mortality during the breeding and non-breeding periods could affect 12 birds per year; 0.05% of the breeding population.

9.268 There is not thought to be any in-combination effects from other offshore developments likely to cause a significant effect apart from potential collision mortality with Beatrice and Moray Firth offshore wind farms.

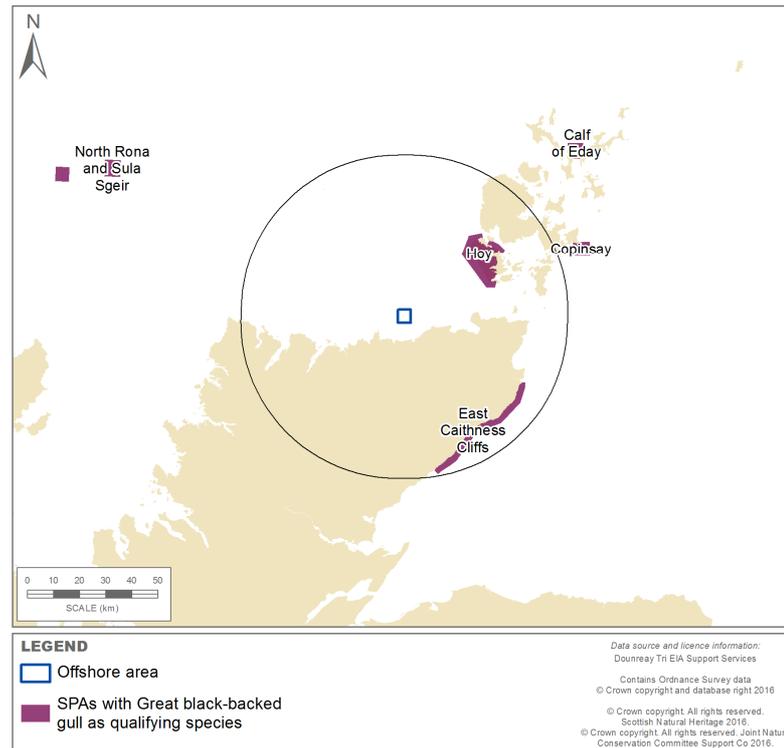
9.269 Population modelling undertaken to support the wind farms within the Moray Firth indicates that the North Caithness Cliffs kittiwake population could sustain the additional loss of

between 117 and 352 breeding adult kittiwakes per year. The in-combination impact of the two wind farms indicated an impact of approximately two birds per year from this SPA and concluded no adverse effect (Marine Scotland 2014). If all 12 kittiwakes predicted to collide each year with the proposed development are breeding adults originating from the one SPA, then the number of birds predicted to collide will be significantly below the range the population modelling predicts will cause a population level effect.

- 9.270 It is recognised that the modelling was undertaken to support larger offshore wind farm projects and may not be directly comparable. However, the results provide an indication of the level of impact collision risk impacts may have on the kittiwakes from the North Caithness Cliffs SPA. The predicted number of collisions is significantly below that predicted could cause an effect by the population model. If kittiwakes are from other SPAs or from non-SPA colonies then the impacts on the North Caithness Cliffs SPA will be lower.
- 9.271 The breeding population of kittiwakes at the North Caithness Cliffs is 10,150 pairs (20, 300 individuals). The loss of up to 14 kittiwakes in-combination with other developments, out of a population of over 20,000 birds is not predicted to cause an adverse effect.
- 9.272 The potential impacts on kittiwake from the proposed Dounreay Tri demonstrator project, alone or in-combination will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Great black-backed gull (*Larus major*)**

- 9.273 During the breeding season the great black-backed gull is a qualifying species for the following SPAs within its potential foraging range of 60 km (Seys *et al.* 2001) (Figure 9-11):
- Hoy,
  - East Caithness Cliffs.



**Figure 9-11: SPAs for which great black-backed gull is a qualifying species and maximum foraging range.**

- 9.274 Great black-backed gulls occurred primarily during the winter period with sightings between January and March and also November. However, peak numbers occurred during the survey undertaken in August when a peak density of 1.75 birds/km<sup>2</sup> was recorded within the wider survey area. No birds were within the project site during this period. The next highest density in March was 0.60 birds/km<sup>2</sup> and less than half the August density.
- 9.275 Great black-backed gulls are at risk of collision with 42% of all great black-backed gulls recorded as flying at rotor height. This is a notably higher proportion of birds at rotor height compared to previous reported flight heights, with between 32.5% and 35% at collision risk height (Johnston *et al.* 2014, Furness *et al.* 2013).
- 9.276 Project specific collision risk modelling indicates that no great black-backed gulls will collide with the two turbines during the breeding period and one during the non-breeding period. Although it is recognised that great black-backed gulls are at risk of collision the relatively low numbers recorded, particularly during the breeding period, indicate that there is a very low risk of collision impact affecting an SPA.
- 9.277 There is no evidence from existing offshore wind farms of any displacement effects on great black-backed gulls (Furness 2016).
- 9.278 Should a barrier effect occur, the effect on a species of bird that forages over a wide area, up to 60 km from the colony, would be negligible.
- 9.279 Great black-backed gulls are not thought to be sensitive to disturbance from boats (Furness and Wade 2012). Should there be any disturbance, great black-backed gulls will be able to relocate to suitable habitat elsewhere. Birds displaced due to disturbance will be able to return following the departure of any vessels associated with the proposed project.
- 9.280 During the non-breeding period an estimated one great black-backed gull may collide with the proposed development. The North Sea BDMP population is 91,399 individuals. A total of 11%

of the UK breeding population occurs in SPAs and consequently the majority of great black-backed gulls during the non-breeding period will not be from a SPA. The Hoy SPA and East Caithness Cliffs SPA breeding population is 470 individuals and therefore make up 0.5% of the BDMP non-breeding population. The risk of one bird colliding during the non-breeding period being from either one the two SPAs is therefore very low.

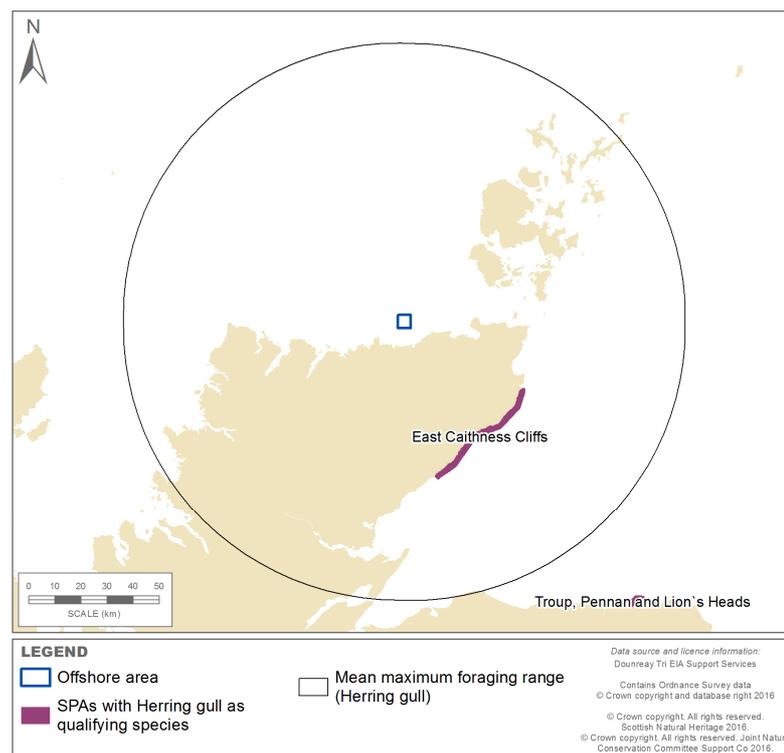
9.281 No impacts are predicted to occur to great black-backed gulls during the breeding period and only one bird during the non-breeding period. Consequently, there is a very low risk of any in-combination effects occurring on the Hoy or East Caithness Cliffs SPAs.

9.282 The potential impacts on great black-backed gull from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

**Herring gull (*Larus argentatus*)**

9.283 During the breeding season the herring gull is a qualifying species for the following SPA within its potential foraging range of 105 km (Thaxter *et al.* 2012) (Figure 9-12):

- East Caithness Cliffs.



**Figure 9-12: SPAs for which breeding herring gull is a qualifying species and mean maximum (+1 s.d.) foraging range.**

9.284 A total of three herring gulls were recorded during the site-specific surveys. All records were during October and therefore outwith the breeding period.

9.285 Although herring gull could occur throughout the year, the absent of any sightings during the whole of the breeding period indicates that this species is at very low risk of be effected by the proposed development. The closest SPA for which herring gull is a qualifying species is the

East Caithness Cliffs which is 47 km away and although within the mean maximum foraging range (+1 s.d.) it is beyond the mean foraging range of 10 km. Consequently, herring gulls from this colony are not predicted to be in the area of the proposed development during the breeding period.

- 9.286 During the non-breeding period three herring gulls were recorded. The the North Sea BDMP during the non-breeding period is 466,511 individuals and therefore the very low numbers recorded during site specific surveys are very small proportion of the non-breeding population. Collision risk modelling indicates there will be no collisions by herring gulls and therefore no impact is predicted to occur during the non-breeding period.
- 9.287 No impacts are predicted to occur to herring gulls during the breeding or non-breeding periods. Consequently, there will be no in-combination effects.
- 9.288 The potential impacts on herring gull from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Peregrine (*Falco peregrinus*)**

- 9.289 The peregrine is a qualifying species for the North Caithness Cliffs SPA, when at the time of citation six breeding pairs occurred within the site.
- 9.290 No peregrines were recorded during offshore surveys. The offshore site is 4 km from the nearest boundary of the SPA and it is predicted unlikely that peregrines will occur in the offshore site.
- 9.291 Disturbance of peregrines during the breeding season could occur during the construction, operation and decommissioning phases of the onshore activities.
- 9.292 The proposed landfall site is outwith the North Caithness Cliffs SPA and an area of relatively low lying coastal features. The landfall location is adjacent to existing infrastructure and not an area predicted to be regularly used by peregrines.
- 9.293 An SNH commissioned review undertaken by Ruddock and Whitfield (2007) assessed the disturbance distances for a number of species, including peregrine. The review concluded that disturbance to peregrines would be unlikely to occur if activities occurred more than 750 m from a nesting bird. It is therefore predicted that there will be no disturbance to nesting peregrines from the proposed project from either onshore or offshore activities.
- 9.294 No impacts are predicted to occur to peregrine during the breeding period. Consequently, there will be no in-combination effects.
- 9.295 The potential impacts on peregrine from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

**Short-eared owl (*Asio flammeus*)**

- 9.296 The short-eared owl is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.
- 9.297 No short-eared owls were recorded during the baseline surveys in the breeding season. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.

9.298 The site is unsuitable for breeding short-eared owl and although they could forage in the onshore area, birds displaced due to disturbance will be able to forage elsewhere in more suitable habitats.

9.299 No impacts are predicted to occur to short-eared owl during the breeding period. Consequently, there will be no in-combination effects.

9.300 The proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species, nor the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

#### **Merlin (*Falco columbarius*)**

9.301 The merlin is a qualifying species for the Caithness and Sutherland Peatlands SPA for breeding season.

9.302 No merlin were recorded during the baseline surveys in the breeding season. The Caithness and Sutherland Peatlands SPA lies 9 km from proposed development area. The onshore development area is outwith the SPA and lies approximately 3 km from the nearest boundary.

9.303 The site is unsuitable for breeding merlin and although they could forage in the onshore area, birds displaced due to disturbance will be able to forage elsewhere in more suitable habitats.

9.304 No impacts are predicted to occur to merlin during the breeding period. Consequently, there will be no in-combination effects.

9.305 The proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

#### **Habitats Regulations Appraisal: SPA Conclusions**

9.306 Based on the information presented in the ES and the associated EIA, it is concluded that the proposed Dounreay Tri demonstrator project will not have an adverse effect upon the integrity of any SPA site either alone or in-combination with other plans or projects. This conclusion is made based on the results from site specific baseline surveys, the predicted level of impact and the extent and/or duration of the predicted potential effects in relation to the Conservation Objectives of the sites.

## 10 Habitats Regulations Appraisal: SACs

10.1 Marine mammals are mobile species and can and do range over wide areas. It is recognised that individuals from designated sites may potentially occur within the proposed development area.

### **Grey seal (*Halichoerus grypus*)**

10.2 The grey seal is a qualifying species for the:

- Faray and Holm of Faray SAC,
- North Rona SAC.

10.3 Only three confirmed grey seal were recorded during site-specific baseline surveys in March, June and July, of which only one was recorded within the project development site.

10.4 Of the 265 tagged grey seals undertaken by SMRU, 34 have been tagged in Orkney. Data from the tagging studies indicate that the proposed development site is not an important site for grey seals as only four tagged seals have ever been recorded within the development site (Plunkett & Sparling 2016).

10.5 The main potential impacts on grey seals will be from noise during construction, operation and decommissioning phases of the proposed development. Piling is not being undertaken during construction and therefore the only effects from noise will be from vessels, cable trenching and anchor handling. Noise impacts from these activities are predicted to cause physical injury no greater than 50 m from the sound source and disturbance no further than 5 km (Plunkett & Sparling 2016).

10.6 Offshore construction noise is predicted to occur over a period of approximately a few months and any displaced grey seals will be able to return to the area once construction has finished. Consequently, any impacts will be localised and temporary and any displaced grey seal will be able to forage elsewhere during this period.

10.7 There is a very low risk of any grey seals from either North Rona or the Faray and Holm of Faray SACs occurring in the proposed development area and the potential impacts will be localised and temporary.

10.8 No impacts are predicted to occur on grey seals from the two SAC. Consequently, there will be no in-combination effects.

10.9 The potential impacts on grey seal from the proposed Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the species or the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

### **Harbour seal (*Phoca vitulina*)**

10.10 The harbour seal is a qualifying species for the:

- Sanday SAC.

10.11 No harbour seals were recorded during site-specific baseline surveys. Furthermore, SMRU have tagged a total of 53 harbour seals in the Orkney and North Coast Management Region, however, none of these had telemetry tracks that crossed the Dounreay Tri Project site (Plunkett & Sparling *et al.* 2016). Consequently, there is a very low risk of any harbour seals occurring within the proposed project site and it is concluded that the Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the

species, nor the conservation objectives of the site and therefore there will be no likely significant effect on site integrity.

### **Atlantic Salmon (*Salmo salar*)**

10.12 Although Atlantic salmon range widely in the marine environment and individuals from a broad range of SACs could, in theory, occur in the area. For the purposes of this assessment the following SACs have been considered based on their proximity to the proposed development:

- River Thurso SAC,
- River Borgie SAC,
- River Naver SAC.

10.13 Salmon may occur within the proposed development area and impacts from noise and physical impacts during construction or from electromagnetic fields (EMF) during operations could cause an impact on them.

10.14 The proposed development will not be undertaking any piling activity and most noise will be from construction vessels. Noise from vessels will not cause a physical impact on salmon but may cause avoidance behaviour. However, the extent of any avoidance is predicted to be very localised and the distance from which activities will occur will not cause any direct impact on any of the SACs which lie between 17 and 24 km away (Table 7-2) and any migrating salmon will be able to swim around the local area of effect.

10.15 Vessel noise during construction is predicted to last a few months and therefore will be temporary. Maintenance vessels will be required throughout the project life. However, the level of vessel activity during operational period is not predicted to be significantly greater than current vessel traffic in the area and therefore will not significantly contribute to the current level of vessel noise in the area. Any impacts from vessel noise will be temporary and localised.

10.16 There is potential risk of Electromagnetic fields from cables causing localised avoidance behaviour to migrating salmon. However most migratory salmonids swim within the top 5m of the water (Godfrey *et al.*, 2014) and therefore will not be affected by EMF emitted from the seabed.

10.17 There is a very low risk of any likely significant impacts occurring from the proposed project on Atlantic salmon and it is concluded that the Dounreay Tri demonstrator project, alone or in combination, will not affect the conservation status of the Atlantic salmon, nor the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

### **Freshwater pearl mussel (*Margaritifera margaritifera*)**

10.18 The freshwater pearl mussel is a qualifying species for the:

- River Borgie SAC,
- River Naver SAC.

10.19 Freshwater pearl mussels are reliant on salmonids (salmon and trout) to allow them to disperse. Although not directly impacted any effects on the salmonids that could limit their ability to disperse could have a significant or adverse effect on the SAC.

10.20 No likely significant effects are predicted to occur on the salmon that occur in the SACs for which freshwater pearl mussel is a qualifying species and therefore no likely significant effects will occur to the freshwater pearl mussel.

10.21 It is concluded that the Dounreay Tri demonstrator project, alone or in-combination, will not affect the conservation status of the freshwater pearl mussel, nor the conservation objectives of the sites and therefore there will be no likely significant effect on site integrity.

#### **Habitats Regulations Appraisal: SAC Conclusions**

10.22 Based on the information presented in the ES and the associated EIA, it is concluded that the proposed Dounreay Tri demonstrator project will not have an adverse effect upon the integrity of any SAC site either alone or in-combination with other plans or projects. This conclusion is made based on the results from site specific baseline surveys, the predicted level of impact and the extent and/or duration of the predicted potential effects in relation to the Conservation Objectives of the sites.

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